DOCUMENT RESUME

ED 472 227 IR 021 351

AUTHOR	Sarner, Ronald, Ed.; Mullick, Rosemary J., Ed.; Bauder, Deborah Y., Ed.
TITLE	Concepts & Procedures. [SITE 2002 Section].
PUB DATE	2002-03-00
NOTE	93p.; In: Proceedings of SITE 2002: Society for Information Technology & Teacher Education International Conference (13th, Nashville, TN, March 18-23, 2002); see IR 021 349.
PUB TYPE	Collected Works - General (020) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC04 Plus Postage.
DESCRIPTORS	Computer Literacy; *Computer Uses in Education; Distance Education; *Educational Technology; Higher Education; *Information Technology; *Instructional Design; Online Courses; Teacher Education; *Technology Integration; *Technology Uses in Education; Telecommunications; World Wide Web
IDENTIFIERS	Learning Communities; Web Sites

ABSTRACT

This document contains the following full and short papers on concepts and procedures from the SITE (Society for Information Technology & Teacher Education) 2002 conference: "Exploring Minds Network" (Marino C. Alvarez and others); "Learning Communities: A Kaleidoscope of Ecological Designs" (Alain Breuleux and others); "PDA's and Research: A Brief Report" (Walter C. Buboltz, Jr. and others); "College Website Review and Revision" (Terence W. Cavanaugh); "Using 'No Tech' Activities To Teach about Technology and Issues of the Online World" (Dianne Chambers and Michael O'Brien); "Metaconceptualizing Knowledge: The Challenge for Teacher Education" (Charles Dickens); "The Advantages of an Active Text" (Brian Felkel and R.L. Richardson); "A Comparison of Online and Regular Learning Contexts in a Course for Teacher Education Students" (Asghar Iran-Nejad and Yuejin Xu); "Technology Overload: Are We Meeting the Needs of the Individual Student?" (Steve M. Jenkins and others); "The Dichotomy of the Conquering Hero: Searching for the Pedagogy in the Teaching of ICT" (A.C. Jones); "Focus First: Strategic Planning and Front-End Development of an Online Teacher Resource" (Cathy Bonus Lalli); "Teaching Multimedia Design Using the 'Tri-Component' Scenario Model and Associated Methods" (Jean-Marc Laubin); "Promoting Student Inquiry: WebQuests to Web Inquiry Projects (WIPs)" (Philip E. Molebash, Bernie Dodge, Randy L. Bell, and Cheryl L. Mason); "Curriculum, Competence, and Confidence: A 3C Approach to Teacher Preparation for Technology-Integrated Practice" (Michael Nord); "The PDCA Model: A Basic Evaluation Tool" (Catherine A. Offutt and Connie J. Casebolt); "Critical Thinking and Electronic Discussion" (Joanne Y. Pelletier and others); "A New Dimension of Teaching in Digital Learning Environments--Teaching Teachers To Teach between Schools" (Ken Stevens and David Dibbon); "Rubrics for Online Learning Evaluation--Learning, Experiencing, Developing, & Applying" (C.Y. Janey Wang and others); "The Crucial Role of Information Technology and Knowledge-Economy for Teacher Education" (Tsung Juang Wang); "Utilizing 'Blackboard' To Engage Teacher Candidates in Higher-Order Thinking" (Saundra L. Wetig); "Computers, Technostress and Breathing" (Lamar V. Wilkinson and others); "Technology and Technophobia: Method for Overcoming" (Lamar V. Wilkinson and others); "Comparing Themes of Critical Reflection from Face-to-

Face and On-Line Discussion in a Course for Teacher Education Students" (Yuejin Xu and Asghar Iran-Nejad); "Internet in Chinese Education: Where To Go?" (Robert Z. Zheng and John R. Ouyang). Several brief summaries of conference presentations are also included. Most papers contain references. (MES)

ED 472 227

Concepts & Procedures (SITE 2002 Section)

Ronald Sarner Ed., Rosemary J. Mullick Ed.; & Deborah Y. Bauder., Ed.

SECTION EDITORS:

Ronald Sarner, SUNY Institute of Technology at Utica/Rome
Rosemary J. Mullick, SUNY Institute of Technology at Utica/Rome
Deborah Y. Bauder, Rome (NY) City School District

As we began to put together this year's *Concepts and Procedures* section, we were struck with two observations: first, the number of selections has increased dramatically, and second that the topical coverage in the section is more varied than ever.

Several themes emerged in this year's selections. One cluster of papers deals with concept mapping, visualization, and knowledge representation. A paper by Robert Jones, Caroline Crawford, Ruth Gannon-Cook, and Jan Willis – all from the University of Houston-Clear Lake analyzes concept patterns found in textbooks. A selection by Marino Alvarez, Michael Busby, Geoffrey Burks and Goli Sotoohi from Tennessee State University, entitled "Exploring Minds Electronic Network, describes the use of the "interactive V diagram" to encourage monitoring, reflection, and critical thinking. A Tennessee State colleague, Charles Dickens, has a paper entitled "Metaconceptualizing Knowledge: The Challenge for Teacher Education. In a somewhat different vein, Victor Kasyanov from the Ershov Institute of Informatics Systems in Novosibirsk describes the use of graphs for visual presentation of "complex and intricate" information.

Issues of equity and ethics form a second cluster. In "Technology overload: Are we meeting the needs of the individual student," Steve Jenkins, Cathy Lott, Walter Buboltz, Jr., and Lamar Wilkinson from Louisiana Tech note the challenge that emanates from the increasing demands of technology proficiency on the part of employers and educators in the typical college setting where only half of each freshman class owns a computer. In a provocative essay, Robert Bruen from Babson College discusses the paradox that increased attention to issues of computer security in our courses may have the unintended impact of increasing computer incursions.

Distance Learning was another topic that generated multiple submissions. No fewer than six papers deal with serving the needs of off-campus students. One submission by Robbie Melton of the Tennessee Board of Regents describes their on-line degree programs. Ken Stevens and David Dibbon from Memorial University of Newfoundland discuss the need to train teachers to work effectively with geographically separated students. Assessment in on-line learning works its way into several papers and is the central topic for a paper by an international team of C. Y. Janey Wang from the University of Texas at Austin, Rafael Cota and Guillermo Espinoza from the ITESM Institute in Mexico. In their paper Wang, Cota, and Espinoza present rubrics as a framework for evaluation. Two selections study outcomes in traditional and on-line instruction. Yuejin Xu from the University of Alabama examined transcripts of on-line discussions and contrasted them with face-to-face class discussions that were videotaped. The study examined levels of student contribution as well as an analysis of style, grammar, and sentence structure in both modalities. The same author collaborated with Asghar Iran-Nejad to examine whether one modality is more likely to change student learning perceptions than the other. Finally, Joanne Pelletier, Margaret Brown, and Gregory McKinnon from Acadia University expand upon their earlier work on *cognotes*, a macro-based coding system for interactive discussion.

Several papers focus on web site design, web site and multimedia design tools, and evaluation of web sites. Included in this section is a paper by Jean-Marc Laubin from the University of Valenciennes in France on teaching multimedia design using what he terms a "tri-component model." Terence Cavanaugh of the University of North Florida discusses web site design features to insure that disabled persons are appropriately accommodated.

Another noteworthy thread consists of two papers by Lamar Wilkinson, *et. al.* from Louisiana Tech on technophobia and technostress. In both papers the authors repeat the often-cited observation

CONCEPTS & PROCEDURES

that the pace of life is increasing, and with it comes a host of medical and social problems for individuals who find it difficult to adapt. In their paper "Computers, Technostress and Breathing" the authors offer suggestions for breathing techniques designed to overcome the physiological effects of stress.

Finally, in what may be a harbinger of what to expect next year, we saw the first paper on the use of personal digital assistants, in this instance as a data acquisition device. We can only speculate with regard to the educational applications for these devices that are likely to emerge in the next few years, particularly when PDAs are used as access points for wireless networks.

Ronald Sarner is Executive Vice President for Academic Affairs and Distinguished Service Professor of Computer Science at SUNY Institute of Technology at Utica/Rome, Utica, NY 13504-3050, e-mail ron@sunyit.edu.

Rosemary J. Mullick is Associate Professor of Computer Science at SUNY Institute of Technology at Utica/Rome, Utica, NY 13504-3050, e-mail rosemary@sunyit.edu.

Deborah Y. Bauder is Executive Director of Technology, Rome City School District, Rome, NY 13440, e-mail dbauder@romecsd.org.

Exploring Minds Network

Marino C. Alvarez
malvarez@coe.tsuniv.edu

Michael R. Busby
busby@coe.tsuniv.edu

Geoffrey Burks
burks@coe.tsuniv.edu

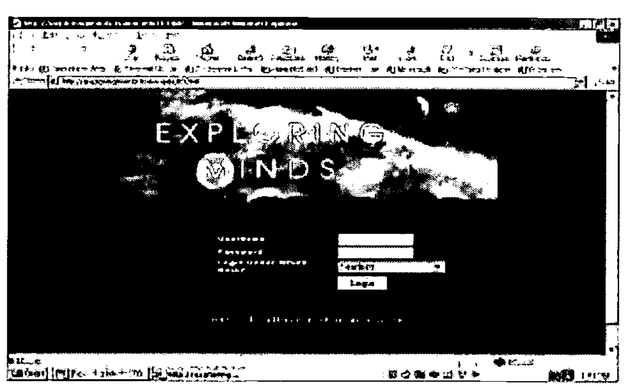
Goli Sotoohi
gsotoohi@coe.tsuniv.edu
Center of Excellence in Information Systems, Tennessee State University
United States

Michael A. Panzarella
Oakwood Systems
United States
mpanzarella@oakwoodsys.com

Abstract: Exploring Minds is an active electronic venue for professors, teachers, researchers, and students to reflect, negotiate, and evaluate the teaching/learning process that enables systemic changes to occur under meaningful and thoughtful circumstances. Ideas are revealed in narrative and visual formats through electronic journals, conceptual arrangement of ideas, and V diagrams so that metacognitive tasks such as self-monitoring, reflective and imaginative thinking, and critical analyses is a crucial part of the learning process. The basic premise that underpins Exploring Minds is that the mind deals with meaning and meaning is the basis for conceptual understanding of facts and ideas.

Exploring Minds Network

Exploring Minds is an educational interdisciplinary project under the auspices of the Center of Excellence in Information Systems, Tennessee State University (http://exploringminds.tsuniv.edu). Exploring Minds is an interactive electronic network that is password protected and contains provisions for teachers, professors, researchers, coordinators, director, and parents/guardians, and students to communicate about their class work and/or research agendas (Alvarez, 2001). The network contains several interactive tools for posting journal entries, constructing hierarchical concept maps and vee diagrams, and storing information (print and nonprint) in a backpack (portfolio). Exploring Minds is a self-contained system that encapsulates transactions between teachers and learning stakeholders over the Internet interactively.



Management System

The management portion of Exploring Minds site is divided into five consoles: Director, Coordinator, Teacher, Researcher, and Students. Researchers at TSU's Center of Excellence in Information Systems and those at affiliated colleges and universities along with teachers and their students manage their own respective students. The Teacher Console enables either the teacher or researcher to assign passwords and usernames, control incoming and outgoing communications between students, and have access to student concept maps, V diagrams, electronic notebook entries, and backpack. Students, once given a password and username by their researcher or teacher are able to construct concept maps, V diagrams, enter notations and thoughts into their electronic journal, notebook, and enter video clips, photographs, journal articles, drawings, simulations, and any other relevant information (print or graphic) into their own backpack or library. Any portion of a backpack can be shared with other students within a given college or university, or school with students at another affiliated colleges, universities, or schools if the researcher or teacher gives permission.

When students want to submit their concept maps or V diagrams for review by their teacher and researchers they submit them directly electronically via the Internet using their account on Exploring Minds. Teachers, professors, and researchers have access to all the features and metacognitive tools available to the students.

Administrative Tools is designed for teachers, coordinators, and director to create, edit, and delete groups (classes) or subgroups within groups with participating members. The Grade Book section permits access to student or participant records of transactions that occur during a semester or year (e.g., assignments, V diagrams, journal postings, etc.). There is also a Profile section where students can change their password and username, enter relevant information (e.g., address, telephone number), and anecdotal information including a photograph. Only anecdotal information is made public and can be viewed by any participant. The Profile allows the teacher, coordinator, or director to access participant records.

Features

Once logged into the restricted section a home page appears that contains newly posted items arranged by group (class). These are messages, journal entries, announcements, threaded discussions, and attachments. Once each message or journal entry is accessed, the teacher or student is taken to the Communications section where the message appears and the option of writing a response that is sent directly to the initiator is accomplished. Likewise if an attached document or V diagram is sent, they are accessed and viewed in the Communications section of the site and can be printed as a hard copy. Every message, once viewed and responded to, disappears from this screen and automatically stored in the Grade Book section under Records. These records are arranged by groups and students alphabetically and each individual's entries can be retrieved by clicking on the name.

A prominent feature of Exploring Minds is a reflective portion containing a journal for students to enter their thoughts and feelings of course content, and an exchange section whereby ideas can be posted and feedback received from professors, researchers, and teachers. Once comments are made and sent back to them, the students then read the response by clicking on the message appearing on the Welcome page. A record (date and time) of each transaction is automatically noted in the students' journal section and also in the journal of the teacher or professor. A notebook is provided to better organize notes taken for a class, a report, or paper. This notebook acts as a storage area and serves the same function as a regular notebook. The difference being that it can be accessed through wireless communication systems such as a laptop computer and information can be gathered from various Internet sources and locations.

Exploring Minds contains an interactive concept mapping component that reveals a visual representation of student thought processes with feedback directly placed on each respective map. A hierarchical concept map is a visual representation of an individual's thought processes. It is a word diagram that is portrayed visually in a hierarchical fashion and represents concepts and their relationships. Students, teachers, and researchers use concept maps as a way to visually display and share ideas using CMap developed at the University of West Florida. Maps developed by participants in our program are stored and accessed on our Exploring Minds server. The V heuristic developed by Gowin (1981) to enable students to understand the structure of knowledge has evolved into an Interactive V Diagram section of the network having a Quick Help menu and a link describing the V components with explanations of the epistemic elements. Also included are instructions for entering information on the V. Information is entered onto the Interactive V Diagram by clicking on the respective field of the arrayed elements and then typing the data. Once the fields on the V template have been completed, the user can review the entries and then electronically submit the information to our base site as an attachment. When received by the teacher or professor, the V diagram is reviewed and comments are made directly on the submitted V. These comments are then sent back by the reviewer to the sender who is then able to read the comments.

A backpack section serves as a repository for student work in progress and contains a files section for importing video, simulations, articles, or any type of pertinent electronic transmissions that is needed by a student. A drawing of the backpack is portrayed with communication, journal, notebook, files, V diagram, and concept map links. These are visually displayed and linked for access.

The teacher has a briefcase from which to navigate the interactive features of the Exploring Minds Network. The features contained in the briefcase that are linked are: grade book, calendar, notebook, journal, V diagram, communications, files, and concept map.

Both the teacher and the student have a study. The study provides a venue by which the teacher creates the reference materials needed for a particular class. Sections of the teacher's library include the files section, reference documents, photo gallery, electronic journals, URL links to relevant sources, movies, articles, and reports. The students can use access these sources and include them in their own library. These items are then stored in the teacher library for student access and retrieval. Likewise, students can use the study and have their own library to collect information and materials for a project, report, or research paper. In this teacher library the materials and references are displayed for student access and retrieval. By clicking on each respective category a display of the requested materials appears and can be viewed or downloaded. The student library enables the student to categorize pertinent information relevant to a specific work within a class or research project.

Conclusions

Exploring Minds provides faculty with a system to communicate more effectively with their students. In addition to the management features (class assignments, class roll, personal calendar, announcements, grade book functions, and course material), the teacher or professor is able to react to student notebook postings on a regular basis and thereby monitor students' thoughts and feelings instead of waiting for end-of-the-semester evaluations. These interactive dialogues, together with visual displays of the concept maps and V diagrams, serve to negotiate the learning process and better serve meaningful understanding between the professor, teacher, and students during the semester or school year.

The uniqueness of Exploring Minds is the active engagement that occurs between teachers, professors and their students afforded through the use of the notebook, concept maps, and interactive V diagrams. In essence, teachers and professors are active learners with their students, and facilitate the learning process by guiding students in their inquires, evoking discussions, and involving their students with other affiliated schools whose students may be engaged in similar research/study topics. Exploring Minds provides a learning context that encourages students to *think about learning* and enables them to learn principles instead of learning prescriptions that they may not understand or partially understand.

Acknowledgements

This paper is supported by the Center of Excellence in Information Systems at Tennessee State University and by NASA through the Tennessee Space Grant Consortium NGT– 40021, Network Resources Training Site (NRTS) NCC5-96, and NASA Center for Automated Space Science NCC5-511. Oakwood Systems was contracted to write the programmatic system for this network.

References

Alvarez, M.C. (2001). "Exploring Minds Network: Revealing Ideas Electronically". In N. Callaos, Y. Ohsawa, Y. Zhang, R. Szabo, & M. Aveledo (Eds.). *Proceedings World Multiconference on :Systemics, Cybernetics and Informatics* (pp. 1-6, vol. VIII Human Information and Education Systems). Orlando, FL: International Institute of Informatics and Systemics.

Gowin, D.B. (1981). *Educating*, Ithaca, NY: Cornell University Press.

Digital Data:
Strengthening the Study of Educational Technology

Savilla I. Banister
Division of Teaching and Learning
Bowling Green State University
USA
sbanist@bgnet.bgsu.edu

Researchers, educators, and businesspeople are engaged in various crusades to encourage or discourage the use of computer technologies in schools. While most of the dialogues in these arenas rely most heavily on the media of verbal and written communication (text), the technologies of the twenty-first century provide other communicative media possibilities, including the use of video, audio, and images, to present and exchange information. An example of a type of research and communication that utilized multimedia technology is examined here.

A year-long study was conducted at a small, urban elementary school, focusing on student and teacher perspectives of computers in their classrooms. Conclusions of the study in traditional textual form were combined with multimedia, CD-ROM technology to produce an interactive compilation of data from the research. An exploration of this product presented during the SITE 2002 Video Festival provided attendees the opportunity to examine this type of inquiry artifact and explore the possibilities embodied in such a process.

Incorporating audio and video data into the research design helped to extend the potential of "thick description". During the times I have shared images, and audio and video clips with the teachers participating in the study, or colleagues interested in my research, they have been very positive in their responses. Actually hearing the emotion and inflection in a teacher or student's voice as they share their ideas, or seeing the students working in the computer lab helps to support the written text. I believe these elements contribute to the trustworthiness of this research. The CD-ROM appendix containing a collection of this data can be used as verification for the descriptions presented in the text, and also as a prototype for others interested in incorporating multimedia in their research designs.

The presentation and integration of images, audio and video included on the CD demonstrates how data in various formats can be preserved and made available to the scholarly community. By selected "Audio/Video Data" from the menu on the CD, one can navigate to data examined in Chapters Four, Five, and Six. In the Chapter Four section, one can click on "Peer Tutoring" and watch two kindergarten boys in the computer lab guide each other through a new application. In the same section, an audio clip of an interview with Ms. Roberson contains her explanation of how the kindergarten students "help each other" on the computers. In the Chapter Six section, the audio clip of Ginny describing the emotional and physical pain involved in the class's keyboarding lessons is included. In these instances, hearing the tones of voice and seeing the facial expressions of the students enriches the descriptions presented in the text. Such representations allow the reader to juxtapose written interpretations with actual scenes and voices from the research site, encouraging critical review.

In the video clip of Mrs. Sprong's Accelerated Math class work, located in the Audio/Video section, Chapter Five, not only can viewers watch the class process, but they can also see this researcher walking through the room, taking notes. The researched is also visible in the "Centertime" video clip, in the Chapter Four section. Her voice can be heard posing questions on the various audio clips. These exa mples give the reader a chance to further evaluate the processes used in collecting the data.

Mixing data types can also provide a unique view of a phenomenon under study. In the Audio/Video section of the CD presenting Chapter Five, a link entitled "Printer Problems" is provided. This particular clip combines a time-lapsed video clip of Mrs. Sprong's AM class during the time when the printer stopped functioning; the audio track paired with the clip contains excerpts from a later interview with Mrs. Sprong explaining what transpired when she attempted to get technical support for this problem. Combining these two elements gives the reader a more powerful view of the frustrations students and teachers experience with technologies.

In these ways, the study is expanded and enhanced with digital data. With more publications embracing the electronic format each year, it is possible that journal submissions could include such digital data for distribution, linked with the written text online. Such provisions have the potential to challenge and deepen critical inquiry.

Learning communities: a kaleidoscope of ecological designs

Alain Breuleux
McGill University • TeleLearning NCE (Canada)

Mary Lamon & Marlene Scardamalia
OISE/UT (Canada)

Therese Laferriere
Laval University • TeleLearning NCE (Canada)

Katerine Bielaczyc
Harvard Graduate School of Education (US)

Morten Søby & Vibeke Kløvstad
National Network for IT-Research and Competence in Education, University of Oslo (Norway)

Abstract. This panel brings together scholars and educators who have worked for many years on fostering technology-enabled learning communities with an emphasis on classrooms and teacher education. The session will focus on issues of design for learning communities, examining existing cases of network-enabled learning communities in the classroom, the school, and the school of education. One driving question for the presentations and discussions is: "To what extent learning communities can be engineered, designed, fostered, and to what extent they are a complex organic entities that come about and evolve on their own?" The specific perspectives presented are: a) Knowledge building communities in the classroom, b) Learning communities in pre-service teacher education, c) The social infrastructure framework for learning communities, d) A networked learning community for teacher education at the national level; the case of Norway, and e) The school as learning community; Issues of leadership and organizational change.

This panel brings together scholars and educators who have in common the fact that they have worked for many years on fostering technology-enabled learning communities with an emphasis on classrooms and teacher education. A number of features are beginning to emerge from their work, in line with the work of Ann

Brown (Brown, 1997) and her colleagues. This panel session will focus on issues of design for learning communities, examining existing cases of network-enabled learning communities in the classroom, the school, and the school of education. One driving question for the presentations and discussions is: "To what extent learning communities can be engineered, designed, fostered, and to what extent they are a complex organic entities that come about and evolve on their own". Because of this tension, our position oscillates between that of the engineer –to build learning communities– and of the ethnographer –carefully observing and documenting a massively complex phenomenon that largely pre-exists and overwhelms the observer. Depending on where we stand along this continuum of positions, we are at times concentrating on what to do to achieve a certain quality of learning communities in teacher education, at other times wondering what conceptual tools are required to appropriate the complexity and quasi-chaotic nature of the learning communities we see unfolding. And what are the desirable and achievable affordances of technology in such a socio-cognitive engineering project? The experiences shared during this panel will illuminate such questions.

1- Knowledge building communities in the classroom. Mary Lamon & Marlene Scardamalia

The knowledge building classroom shares many of the processes of the classroom as a learning community; but it is more concerned with how students advance beyond present knowledge. They do this through the creation of new theories or the improvement of old ones through innovation, testing, and revision of ideas. Knowledge building classrooms, in their search for constructing cognitive artifacts (new knowledge, new representations, explanations), function in much the same way as scientific research teams operate. These research teams aren't only trying to learn about existing theories, they are trying to advance those theories.

Can you create a knowledge building classroom without information and communications technology? Possibly, but we think that today's technologies make it possible to teach in new ways--to do things differently or even to do entirely different things. One significant way that information and communications technology makes a substantial difference is that it opens up dialogue within communities for a substantive period: Ideas that are thought of and then forgotten can be revisited, revised, added to, and perhaps risen above (Scardamalia, 2000). In support of discourse that transforms a learning community into a knowledge building community, Bereiter and Scardamalia and their team created software, Knowledge Forum®, a problem-centered collaborative knowledge medium that operates over a computer network (Scardamalia, Bereiter & Lamon, 1994). This computer system, perhaps unlike others, was based on cognitive science and socio-cognitive studies about how expertise develops and grows.

2- Learning communities in pre-service teacher education. *Therese Laferriere*

Twelve principles emerge from this multi-year, multi-site design experiment to foster and sustain learning communities in teacher education in Canada and abroad focusing on ICT integration to curriculum and collaborative learning. design-experiment in four different contexts. Key trajectories of these principles are: from material connectivity to social networking, increased or sustained crossings of institutional and cultural boundaries, and the gradual deprivatisation of pedagogical practices.

3- The social infrastructure framework for learning communities. *Katerine Bielaczyc*

Focuses on the social support structures that teachers achieve around computer-supported collaborative tools in order to create environments for classroom learning communities. This "social infrastructure framework" allows us to frame and analyze practices that foster learning communities.

4- A networked learning community for teacher education at the national level; the case of Norway. *Morten Søby & Vibeke Kløvstad.*

Will present the perspective of a national level, with emphasis on the design of web-based tools for the community of innovative teacher education institutions in Norway.

5- The school as learning community; Issues of leadership and organizational change. *Alain Breuleux*

This perspective concerns the specific case of *educational institutions* as learning communities. The key institutions that are examined are the schools and schools of education, and their relevant aspects are: A driving purpose and an actively shared vision, a repertoire of practices (in particular intellectual practices and governance practices aimed at building and sharing knowledge), and systems of values and beliefs. The notion of institution includes different levels diverse realities: from the one-classroom school in the village, the school district, the college, the school of education, and emerging new forms of school networks and institutional alliances between the above. A related issue is the connection and desirable alignment between these different types and layers of institutions, with their specific ways of becoming learning communities. Learning communities at the school or school of education levels will be distinct from other learning communities by a focus on organizational change and, in particular, on issues of leadership. Important questions will include: What is the role of institutional leaders in the strategic transition towards learning communities? How can institutional leaders themselves constitute learning communities that specifically focus on building, learning and sharing leadership practices?

References

Bielaczyc, K. and Collins, A. (1999). "Learning communities in classrooms: A reconceptualization of educational practice." In Ch. M. Reigeluth, (Ed). *Instructional-design theories and models: A new paradigm of instructional theory, Vol. II.* (pp. 269-292). Mahwah: Lawrence Erlbaum Associates. Available at: http://home.neo.lrun. com/ourspot/learn001.txt

Brown, A. (1997). Transforming schools into communities of thinking and learning about serious matters. *American Psychologist, 52,* 399-413.

Holmes Group. (1990). *Tomorrow's schools; Principles for the design of professional development school.* East Lansing, MI: Authors.

Scardamalia, M., & Bereiter, C. (1999) Schools as knowledge-building organizations. In D. Keating & C. Hertzman (Eds.), *Today's children, tomorrow's society: The developmental health and wealth of nations* (pp. 274-289). New York: Guilford.

PDA's and Research: A Brief Report

Walter C. Buboltz, Jr.
Department of Psychology
Louisiana Tech University
United States
Buboltz@latech.edu

Tony R. Young
Department of Psychology
Louisiana Tech University
United States
Tyoung@latech.edu

Lamar Wilkinson
Department of Psychology
Louisiana Tech University
United States
Lamar@latech.edu

Adrian Thomas
Department of Psychology
Western Kentucky University
United States
Adrian.thomas@wku.edu

Abstract: The explosion and infusion of technology into the educational environment has lead to a multitude of new research tools that are available for conducting research. Personal digital assistances (PDA's) are one of these new exciting technologies that can lead to research that taps areas and constructs previously unexamined. Additionally, PDA's may allow data collection that is more instantaneous and focus on the moment when an event occurs. This articles reviews the uses of PDA's and how it may be applied to various research areas.

The explosion and infusion of technology into the educational environment has lead to a multitude of new research tools that are available for conducting research. Researchers have been using the Internet for the past few years to collect large data sets and explore areas that were not feasible using more traditional research approaches. The continued development of technology has lead to another technological breakthrough, namely, Personal Digital Assistances (PDA's) that may open many more avenues for research in the educational and other realms. This paper provides an outline of the uses of PDA's in research and hopefully brings to awareness the potential of PDA's in research.

The use of PDA's in research may over time reveal many shortcomings of traditional paper-and-pencil assessment instruments. Research has shown when individuals recall past experiences, people tend to remember peaks of emotional intensity, or the most recent things, or are influenced by the context, or how they feel at the moment they are completing the assessment instruments. With this in mind, researchers that collect data after events have occurred or ask individuals to report about behaviors and experiences in the past may not be getting accurate data. In response to this researchers are calling for a change in the collection of self-report data. Researchers have suggested that two major changes need to be done to overcome these potential problems and influences. One is that researchers need to collect data at the moment, which takes the time factor into account instead of waiting to collect data about that particular moment at some later data. Second, data collection needs to take into account the environment, thus data collection should occur in the environment where the phenomena is occurring. The use of programmable PDA's may be the research tool that can overcome the shortcomings of more traditional paper-and-pencil data collection.

Personal Digital Assistants (PDA's) have come to market during the past five years as a storm. Initially, only one or two hardware companies made and sold the products. Now virtually every hardware maker, plus several companies that make only PDA's have multiple products on the market. Additionally, as the competition as has grown between companies the capabilities and software available for PDA's has grown exponentially. At the current time PDA's are programmable, have expansion slots and can handle large volumes of data. Due to programmability, survey's can be developed for research and the information collected can be downloaded into data sets that can be used for statistical analyses. This is only the tip of the iceberg, the true potential of PDA's in research lies in the ability of the researcher to collect data at various times or intervals. PDA's can be programmed to cue the research participant to fill out a survey on the PDA at predetermined times, or at random intervals during the day. Additionally, the research participant can be instructed to complete surveys on the PDA during or immediately after an event of particular significance. Through the use of PDA's data collection can occur in real-time within the environmental context of their daily life.

The advantage of PDA's is not just limited to research. PDA's may have widespread implications in the educational realm and for the treatment of many problems. In the educational realm students can purchase PDA's or be provided with PDA's as part of a course. The instructor can then provide students with notes, outlines, and reminders when assignments are due. Additionally, the instructor can have the PDA programmed to help students develop a study schedule and on what materials to focus on. The implications in the educational realm appear endless at this point and need further investigation. In terms of treating problems applications can be developed and used to cue individuals regarding their efforts to change destructive habits of thought and behavior. Additionally, the treating professional can provide the individual with a host of information on a PDA that can be used by the individual to reinforce and encourage treatment compliance between actual meetings.

The use of PDA's in research and treatment is not an easy task and several issues need to be address and tackled before employment should be undertaken. First, researchers should ask, is there a more convenient and cost-effective way to collect the desired data. If there is a more cost effective procedure for collecting accurate data, that avenue should be pursued. Second, can the PDA be programmed to collect the desired data. Due to size of screens and internal memory, questionnaires need to be short and concise. In conjunction with this since collection of data may occur continuously or various intervals during the day, the short the questionnaire or data asked of the individual the less intrusive will be the data collection procedure and higher compliance will hopefully results. Third, can training be provided to subjects on how the PDA works and what needs to be done to have the subject collect the data for the researcher. If these questions can be effectively dealt with, it may be feasible to employ PDA's in the research endeavor.

Once the decision has been made to use PDA's the researcher needs to program the PDA with the survey's or other instruments that will be displayed. Numerous programs available and it would behoove any research to explore the options available and chose a software package that best fits the need for data collection. After that has been accomplished the time frame for data collection must be established, such as daily, three times a day, etc. At this point the PDA needs to be programmed to provide a reminder to the subject to complete the survey or instruments at the desired times.

With the PDA's programmed and ready to go, the researcher now needs to recruit subjects for the research and train them in the use of the PDA and what will be expected of them in the research process. It should be noted that at this point it necessitates that enough PDA's are available for each subject that will be participating in the research. Once subjects are fully trained and understand the uses of the PDA and what is expected of them it may be beneficial to pilot the data collection process to look for possible difficulties that need to be overcome before final data collection commences.

Once the final data collection procedures have commenced the researcher needs to provide technical support to individuals in the study and ensure the continual operation of the PDA's. As individuals complete the research project they turn in the PDA and the researchers is able to download the data collected to a number of programs that will allow analyses of the data and would return to more traditional ways of conducting research.

As can be seen the use of PDA's can be time consuming and difficult to accomplish, but the trade-off to examine areas that have not been previously examined can be tremendous. This paper has discussed some of the issues surrounding the use of PDA's in research and treatment and we hope that we have raised awareness of the potential uses of PDA's in research. The use of PDA's in research and treatment is just beginning to emerge and shows promise as a tool that can go along way to enhance may fields in the social sciences.

College Website Review and Revision

Terence W. Cavanaugh, Ph.D. Curriculum and Instruction, University of North Florida, Jacksonville, FL USA.
tcavanau@unf.edu

Abstract: Websites are becoming increasingly important for schools as support for teachers, administrators, counselors, students, parents, and the community. Jamie Mackenzie (1997) offers four reasons for maintaining effective school websites: introducing visitors to the school; pointing students to useful web resources; publishing student work; and collecting data on curriculum projects. Developing or redeveloping a school's website can become a complex process and it requires careful planning. Investigating who will use the site, what information users will require or appreciate, and maximizing useful ways to present the information are important steps. Who will use the site also brings up the important question of who can use the site? Any revision of a website must include accessibility issues for their content. The US government and the W3C consortium has accessibility guidelines for websites that will assist school website reviewers and designers in adapting their sites so all users have equitable access.

Need

An education college website should have as its mission to recruit, support, and inform current and future students and faculty about the college and the profession, while modeling educational principles. In interactions with users of a local College of Education website, it was determined that the site had become outdated and did not fulfill its mission effectively. The dean assigned the task of revising the website to the college technology committee, and a member was selected as the coordinator for this revision.

In a college that has deaf studies and special education programs, an additional concern was accessibility for disabled users. To that end the college wanted to make sure that its website would model proper application of accessibility guidelines as promoted by the W3 Commission and the US government's Section 508 of the Rehabilitation Act concerning Electronic and Information Technology.

Revision

Guidelines directed by the W3 Commission indicate that to achieve a minimum conformance level of "A," a site had to meet all of the priority one elements concerning the following conditions:

- Provide content that conveys essentially the same function or purpose as auditory or visual content;
- Ensure that text and graphics are understandable when viewed without color;
- Clearly identify changes in the natural language of a document's text and any text equivalents;
- Ensure that tables have necessary markup to be transformed by accessible browsers;
- Ensure that pages are accessible even when newer technologies are not supported or are turned off;
- Ensure that moving, blinking, scrolling, or auto-updating objects or pages may be paused or stopped;
- Ensure that the user interface follows principles of accessible design: device-independent access to functionality, keyboard operability, self-voicing, etc.;
- Use features that enable activation of page elements via a variety of input devices; Provide context and orientation information to help users understand complex pages or elements; and
- Ensure that documents are clear and simple so they may be more easily understood (Web Content Accessibility Guidelines 1.0, 1999).

From the initial analysis of our site it was determined that improvement was needed in alternative text tags, use of framesets, and identification concerning the languages and html formats on the individual web pages.

Research was started to find tools to assist in evaluating the site to improve accessibility. There are several tools available, many of which have no cost. Some of the free tools that were examined were Bobby from

CAST, HTML & CSS Validator from W3C, A-Prompt from the University of Toronto, and the 508 Accessibility Suite for Dreamweaver. It was decided to use A-Prompt as the evaluation tool because of ease of use and because of its assistance in identification of problems, as well as in guiding and assisting in their correction. An excellent listing of tools to assist in evaluating and repairing sites for accessibility is the Evaluation, Repair, and Transformation Tools for Web Content Accessibility from the W3C Web Accessibility Initiative at http://www.w3.org/WAI/ER/existingtools.html.

The next step was to find out specific ways that users felt the site was not fulfilling its mission. The initial part of this investigation included a series of interviews with faculty members and students to find out what they found useful about the current site, what problems they had, and how they felt that it could be improved. This information was then taken to a professor teaching a course on educational web design. The professor and her students in that class participated by taking the information gathered from the interviews, their research on effective web design, and their own experiences with the college's website and creating an evaluation instrument for the site as a class project. This educational website evaluation instrument contained questions relating to: the design of the site, including the visual elements, layout and ease of navigation; usability and readability, ease of use, user satisfaction; educational value of the appropriateness of the content for its purpose and audience. Also there were open-ended questions concerning new needs, organization, and information. The instrument was given to a variety of individuals ranging from faculty, students within the college, upcoming students, and even high school students who were visiting campus.

From the analysis of the instrument results, the following areas needed adjustment or addition. The college should provide information concerning pre-college requirements about what to take and do for the first two years as an undergraduate. There should be information available about faculty including their teaching and research areas, contact information, links to their web pages and email accounts. Navigation needs to be clearer concerning divisions or sections within the college and their programs and services. A design component that was found needing was to make sure that all college pages had descriptive meta-tags, ensuring that they may be found more easily through search engines.

Each phase of the redesign was reviewed and approved by the college's technology committee using mock up web pages, navigational concept maps, survey and interview results, and accessibility needs. A more efficient method was developed for faculty members to submit content changes through their department. This format is an accountability system for the changes, and a method for responding back to the person making the request. From our college site review process we feel education college sites should achieve accessibility by meeting W3C and ADA compliance standards to reach at least the "A" rating put forth by the W3C commission for accessibility.

Conclusions

College sites should provide information not only to current students, but to prospective and future students. This information can include the programs that are available and the number of hours and courses required for programs, images or photographs of students and facilities spread throughout site, the college mission and vision statement, course descriptions, and especially pre-college information including necessary courses to take during the first two years, important forms, dates, required tests, and any other relative information.

There should also be a notable faculty presence on the college site. At a minimum there should be short pages for all faculty that provide information about the faculty to students and other stakeholders. The faculty pages should include the faculty members' teaching areas, their research areas of interest, how to contact them (including building, office, phone, e-mail, etc.), a link to faculty members' personal pages. Also it is important to include with the faculty the adjuncts that teach at the college.

A committee of the college must direct the maintenance and structure of the college's website. Faculty members need to have input and knowledge of procedures regarding concerns, such as errors on pages, or the possibility of adding new pages or sections. A clear set of directions is needed about site changing procedures. The site committee should include persons who have ongoing interactions concerning the college; it should not be left totally with people who are not intimately aware of the climate and concerns of the college.

Using 'No Tech' Activities to Teach about Technology and Issues of the Online World

Dianne Chambers & Michael O'Brien
Science and Mathematics Education
Faculty of Education
The University of Melbourne, Australia
d.chambers@unimelb.edu.au m.obrien@edfac.unimelb.edu.au

Abstract: Whole class or large group activities using learning technologies can be difficult when IT resources are scarce or in high demand. In response to this challenge creative 'no tech' teaching activities are used that powerfully explore concepts and issues encountered in the online world. In this paper we describe several activities that have been used successfully with teacher education students and with children to develop an understanding of high tech concepts and of issues encountered in the online world. These activities can be used before students go online, to complement online activities, or if no online access is available. These activities demonstrate how students can develop a rich understanding of high tech issues without access to high tech resources.

Introduction

Although many teachers would like to use learning technologies with their students it is not always possible, for instance when IT resources are scarce or in high demand or, in many schools, for whole class or large group activities. This is true not only in developing nations where access to computing equipment may be limited, but also in countries like the United States and Australia where certain schools, institutions and sections of the community have reduced opportunities to participate in the new information-based economy. A 1999 report of US Department of Commerce concluded that Americans on the wrong side of the so-called Digital Divide are about 20 times more in danger of being "left behind" (Irving, 1999). One response to this situation has the teacher demonstrating the available technology at the front of the class, with students looking on, and perhaps taking notes, but not actually engaging with the concepts presented. A challenge, then, for teachers with limited access to high tech resources is to find or develop activities for students that will actively engage them and enable them to gain an understanding of, and confidence about, concepts relating to online technology. In addition, the authors believe that well-designed 'no tech' learning activities can be *more powerful* in developing conceptual understandings than use of high tech equipment. These 'no tech' learning activities and teaching strategies can powerfully explore terminology and issues encountered in the online world. To be effective, these activities must engage students in learning. Following are several 'no tech' activities about concepts relating to the Internet and issues encountered when going online that we have used successfully with teacher education students, with children, and with practicing teachers.

These activities are effective because they start with existing reference points students understand. Abstract concepts such as hosts, packets, glitches, security, anonymity, confidentiality, potential perils of 'chatrooms' and even cyclical redundancy checking become understandable when students used concrete objects such as balls, pens and paper, and each other to explore these issues. By actively engaging in their own learning students gain an understanding of issues relating to being online and how the Internet works, in ways that passively listening to a teacher – or watching a multimedia presentation – cannot. It has been found that, whatever the level of access to technology, these activities develop a good conceptual understanding of the topic, generally much richer than if high tech resources had been used!

Learning about Online Communication

PaperNet is an activity co-developed by one of the authors (see O'Brien & Nicola, 1998) that uses pen and paper to explore issues of online communication. Through participating in the activity participants will understand issues about online chat and email, even of they have never been online. In this activity each participant is allocated a number that represents their email address and participants sit in a large circle facing outwards. Each individual knows their own number and the range of numbers used, but not the email address (number) of the other individuals involved (that is, everyone is anonymous to begin with). The participants send messages to each other, written on paper and addressed (with a number) to the other participants. These messages are delivered by people inside the circle representing the network (the 'networkers').

Because, initially, no one knows who anyone else is, those taking part gain an understanding of being participants in a chat-room. Students can choose to reveal who they are or choose to represent themselves as whomever they wish. In general no guidance about identity is given to participants — the questions about identity and anonymity are raised by the participants as they play the game.

Later, the participants sit facing inwards and repeat the exercise. Because they now know with whom they are communicating, it is more like sending and receiving email. It has been found that some 'networkers' peek at the messages — this leads to discussions about privacy and censorship.

During and following the *PaperNet* activity, very complex issues are raised by questions and are discussed and explored. Issues that have arisen in the discussion during and after this activity include:

- Privacy – did the 'networkers' read the messages? Should they?
- Censorship – should the networkers check the contents of messages for sutability? Should they? Must they? Should the networker be blamed for delivering an unpleasant message?
- Identity – was everyone honest in representing themself? How hard was it to pretend to be someone else? Can we rely on what people tell us online? Should we give our personal details out over the Internet? Should we? Must we?
- Anonymity – what freedoms are there when anonymous? Can these freedoms be abused?
- Safety Online – what things can we do to make using the Internet safer?
- Bandwidth – how could we get over 'log jams' of messages?

When undergraduate education students participated in the *PaperNet* activity and following the debriefing discussion, they were asked to reflect on how participating in such an activity might help a novice user's understanding of online communication. Reflections by undergraduate students included:

"The illustration and parallel between the game and the reality of email is really concrete and visible. It is solid demonstration, rather than a teacher just talking about it."

"The activity makes a sophisticated "invisible" procedure visible, accessible and easier to understand. The working demonstration of email can integrate into the participants' preexisting knowledge."

Following are some comments by children aged 10-12 years who played the *PaperNet* game as a classroom activity. At the time none had used email or online chat.

"I liked the first Internet game the best because no one knows who you are and you can annoy people."

"The Blind game was the best because I couldn't see who I was writing to."

"I liked the second game because I got lots and lots of mail."

"It was hard being a networker, there was so much mail to deliver I couldn't handle it."

"Someone asked me if I was a boy or a girl, and I said that I was a boy when I'm really a girl. It was fun pretending to be someone else."

Learning about how the Internet Works

These activities are from Stephen Gard's excellent book *The Internet: A Resource for Australian Schools* (Gard, 1998). This book is a fabulous resource for teachers, whether they have access to high levels of technology or no access to technology.

The Robust Nature of the Internet

In a game called *Internetball* the participants stand in a large space in a grid pattern. Each participant represents a host in the network and the ball represents a message being passed through the network. The aim of the game is to pass the ball (message) to an adjacent (or nearby) person and get the ball from one end of the grid (network) to the other. Once participants have an idea of how a message (ball) gets passed through the network via the hosts (people) you can create 'glitches' by, for example, getting all green eyed boys to squat down and no longer be a functional part of the network. An alternate path for the message must be found when hosts become afflicted by these 'glitches' and become non-functional. This activity demonstrates the robust nature of the Internet which is a highly reliable system for data communication, because if one host in the system is knocked out, there is always another to turn to and the message will get through

Error Checking of Data

Another effective (and fun) learning activity from *The Internet: a Resource for Australian Schools* (Gard, 1998) is *Packet Panic,* a game that demonstrates how data are passed as 'packets' and are error-checked to ensure that the whole message has been passed and that its parts are reassembled in the correct order at the receiving end.

To begin, play the childhood game where a person is given a message and it is whispered to the next person and so on until the last person tells the group the message they received which, after passing through a succession of players, is usually different to the original message. Discuss the unreliability of sending messages in this way and how the Internet would not function adequately if data were sent in this manner.

To play *Packet Panic* get students to create a short sentence (four to six words) that gives a simple instruction such as "Take off one shoe" or "Stand on one foot". The message is then written onto cards with one word per card and the number of the word in the sentence also on the card. The last word in the sentence has the additional word 'end'.

1 **Take**	2 **off**	3 **one**	4 **shoe** end

The cards are shuffled and given to another group (who does not know what the message is). One person has the cards (the 'sender') and the rest of the team (about six people) are in a line with a few metres (yards) between each participant. The first person (the sender) reads one card, goes to the next person in line and whispers the contents of the card (the 'packet' of information) to her, such as "off, 2". The second person verbally 'passes the packet' to the third person up the line, and so forth. When the words gets to the last person (the receiver) he writes down the words received and says what he heard back to the previous person in the line. The message then makes its way back to the sender. If she receives back the same message that she sent, then she puts that card aside, knowing that that part of the message has been received correctly. She then sends the words on the next card. If the message that returns is not the same as the one sent then she resends the message. [Other packets of information (words on the cards) can be sent before the confirmation of the previous has been received, but is not recommended early on or chaos may break out!] The receiver reconstructs the original sentence by putting the words in the correct order and knows how many words there are in the sentence from the 'end' data. Regardless of the order the words are sent in or any errors occurring in sending some of the words, the checking by the sender means that each message will eventually be received correctly. The receiver then follows the instruction to show that the message was received. (This activity can also be set up with teams racing to correctly send a message.)

Where *Packet Panic* differs from the common children's game is that the 'sender' and the 'receiver' maintain a dialogue (via the team) in which they compare notes about what has been sent and any lost or damaged packets are resent until the message is complete and correct. The activity demonstrates that modern data transmission techniques ensure almost error-free message handling (cyclical redundancy checking). This is a concept that would be difficult for most children to develop an understanding of, yet this activity illustrates this complex topic in an easy to understand way.

Conclusions

Activities such as these create a scaffold of understanding and can be useful both when IT resources are scarce or for topics where off-computer activities provide a richer learning environment about high tech issues. There are many concepts relating to IT use that are better explored for understanding when not at a computer, but rather through the use of low tech or no tech activities as illustrated above. The types of discussions raised by these activities are very rich and explore topics that may otherwise be invisible. By engaging in learning activities such as these, students create a scaffold of understanding by operating within paradigms they are comfortable with. Abstract concepts can be explored, discussed, and dissected. Technology novices can gain confidence and awareness of what awaits them in the online world before they have access to a computer or the Internet.

References

Gard, S. (1998) *The Internet: A Resource for Australian Schools*. Sydney, New South Wales: MacMillan (Further information about the book is available from<http://mac-ed.macmillan.com.au/pls/mc_edu/what_new_pg13> [Accessed 20 December, 2001]

Irving, L. (1999) *Falling through the Net: Defining the Digital Divide*, Report of the National Telecommunications and Information Administration, United States Dept. of Commerce [Online] Available: <http://www.ntia.doc.gov/ntiahome/fttn99/contents.html> [Accessed 14 September 2001]

O'Brien, M. & Nicola, P. (1997) PaperNet. Metro Education: Approaches to Teaching Media & Communication, *Journal of the Australian Teachers of Media*, Vol. 13.
Also available online: <http://www.bayswaterps.vic.edu.au/teachers/obrien.htm> [Accessed 14 September 2001]

How One Educational Technology Professor Integrates Teaching, Research and Service

Alice Christie, Arizona State University West, U S

This paper describes how community service, research and teaching can be fully integrated by an educational technology professor by creating a partnership with a K-6 school. It describes the partnership development process, the grant-writing process, and the implementation process. Roadblocks that threatened the partnership are discussed as well as suggestions for overcoming these obstacles. Specifics about the integration process are discussed in depth.

The partnership between a university and a local elementary school serves a low SES population with few home computers and little Internet access. This project uses existing facilities to provide an after-school Community Technology Center where students, parents and other community members can have access to computers, email, the Internet, and computer instruction. In addition, many teachers in the school lack the skills to use technology effectively within their classrooms. The university professor will provide training to remedy this problem. Classes and access to the Community Technology Center are free to all community members.

This collaborative partnership is advantageous for all stakeholders: elementary school students and teachers will benefit from using the Technology Center after school hours; school and district administrators will satisfy parents wishing greater access to technology for themselves and their children; community members will benefit from access to computers and computer instruction; university undergraduate and graduate students will have opportunities will observe K-12 technology integration; several graduate students serving as research assistants will gain knowledge of qualitative research methods; and the university professor will conduct an extensive research study on students, teachers and parents using technology in a community setting. This project therefore provides the university professor with a strategic way to integrate teaching, research, and service.

GWeb Portal

Francesco de Leo, The George Washington University, US

The GWeb Portal is a centralized online environment developed to fulfill the varied needs of The George Washington University students, faculty, alumni, staff and friends. The ability to integrate email, online student registration, courseware software, enterprise data and other existing resources into a comprehensive single-sign-on portal allowed for greater application interoperability, extended usage, and enhanced University wide communication.

The GWeb portal is based upon a mix of academic and personal services to encourage use and promote community interaction. While the University's main purpose is to facilitate academic study, GWeb recognizes that the bond between the student and the University extends beyond the classroom. Considering that bond, services of personal nature, such as weather from around the globe, movie show time listings, comics, and classified ads provide resources that would otherwise require users to search elsewhere for these features. The aggregation of the GWeb services increased usage and therefore the effectiveness of communication between the University and its constituencies.

Today, thanks to its proven infrastructure, more and more applications are being built on top of the GWeb architecture to facilitate the University's operations and academic learning.

Currently, GWeb includes the following features:

- Role-based configuration. Users are presented with applications and communication that are relevant to their affiliation within the University (i.e. student, staff, faculty, alumni, or guest).
- Entertainment: GWeb modules include news from washingtopost.com, weather from around the world, comics, horoscopes, movie show time listings, live broadcasts of GW's radio station, real-time cameras from around campus, and classified ads.
- Role-based polling and surveys. Users are presented with polls and surveys that are relevant to their affiliation within the University (i.e. student, staff, faculty, or alumni).
- Content management and distribution. Organizations and departments within the University can post news and events on the portal and have the same content syndicated out to their own website on the WWW server.
- Online directory: Users can search email and campus addresses for faculty and staff.
- Access to external applications. The portal provides single sign-on to Email, library catalogues, and Prometheus (the University's courseware application).
- Secure distribution: Faculty and staff can now obtain instant, secure access to their personal identification numbers for accessing SCT's BANNER over the web.
- Leave tracking system. Provides GW employees with a method for requesting and tracking leave.
- Employment listings and employment applications. Allows users to browse and apply online for GW employment opportunities.
- Training registration: Allows users to manage GW systems training and other short-term courses.
- Bookmarks and Web Notes. Users can bookmark web sites or save the contents of various web pages through GWeb. These bookmarks and notes can then be shared with other GWeb users and accessed from any computer.

Visit GWeb at http://gweb.gwu.edu

Metaconceptualizing Knowledge: The Challenge for Teacher Education

Charles Dickens, Department of Teaching & Learning, Tennessee State University, USA,
cdickens@tnstate.edu

Abstract: The challenge today in teacher education is not to teach about technology, or with technology. It is, rather, to facilitate a different conception of what constitutes knowledge. Current concepts are still driven by an image of reality that was created over three hundred years ago. The Cartesian and Newtonian assumptions about a universe that can be known by knowing the nature of its component parts is no longer viable. The model for our present understanding of reality is one of particles, uncertainty, and tendencies. This paper explores the relationship between the digital universe and the physical and the necessary changes in our accepted concepts of the principle concepts that we take for knowledge

What is knowledge? What do teachers need to know about knowledge? Why are these non-trivial questions for twenty-first century teachers?

A few decades ago, the premier learning theory adopted in schools was a behavioral one. Learning was defined as an observable change in behavior. Knowledge was assumed to be discrete and generally factual. It was a substantive body of information that appeared to exist independently from those who taught it and those who were to learn it.

In the late sixteenth and early seventeenth centuries the locus of control for this body of accepted knowledge shifted from a the world as interpreted by the Church to a world being redefined by man. Space and time were inextricably and mathematically linked by Descartes's coordinate system of analytic geometry. Bacon's formalization of inductive logic opened the way for the development of science as the only trustworthy path to true knowledge. Newton's remarkable "laws" of motion were mathematically proven and empirically verifiable.

The paradigm of the enlightenment's world view, contributed by M. Descartes, was that the universe was like a great clockwork. It had a mechanical order that could be discovered by considering its component parts. Knowledge of the whole could be apprehended by studying and assembling its parts.

Knowledge was subject to change, of course, but it was a systematic change that substituted some parts for others. The changes did not challenge the underlying assumptions of the clockwork metaphor.

Changes wrought by twentieth century science did begin to chip away at this image of reality. Einstein's relativity reorganized space and time and their relationship to each other. Physicists and mathematicians were creating a radically different view of the underlying structure of reality that has yet to be assimilated into our collective consciousness. We still cling to the Cartesian and Newtonian view and the relative security and certainty it offers us.

In education, Descartes and Newton's legacy was evidenced by the public adoption of a behavioral theory of learning as recommended best practice a quarter century ago. Behavioral psychologists like B. F. Skinner proposed what were purported to be "laws" of human behavior, just as Sir Isaac had thought he was doing for physical science. Today, however, we consider best practice to be based on a constructivist view of learning, especially in recommendations for integrating the use of technology with classroom practice (Grabe & Grabe 2001, Jonassen 2000, Jonassen et. al. 1999).

It is rather ironic that one of the forces that drove the recent shift of focus in learning theory was research into artificial or "machine" intelligence, once a very small and arcane branch of computer science. Models of thinking in the form of sophisticated computer programs were used to test theories about human thinking and problem solving.

Today we have in our homes and schools computers that are far more powerful than those used to develop the first A.I. programs and early "expert systems." We are becoming a wired society and part of a global culture of a metaphorical "cyberspace." Having this technology in the schools means more than the need for teachers to learn new methods of instruction. It is a defining technology that has the potential for altering the ways we think about ourselves and our world. This means teachers will need a radically different notion of the nature of knowledge than they have had. It also means that their students will need to develop their own understandings of what knowing and learning are that will better serve them in the future.

In closing, I want to share a selection of definitions by experimental architect Lebbeus Woods (1991):

> DETERMINATE FIELD: a geometrical field pre-determined by a self-consistent set of rules of operation; e. g., the Cartesian field.
> FREE FIELD: geometrical field unpredictably determined by the complex flux of conditions within the field; e. g., the field of non-linear systems.
> NETWORK: an ephemeral, freely evolving, unpredictable dynamical four-dimensional pattern.
> CIRCUS: a cybernetic state of free interactions; a community of autonomous performers, continuously re-formed by the independent choice of each; a feedback loop; a recursive mechanism.
> PHENOMENON: a description of experience.
> CONSTRUCTION: the invention of reality.
> REALITY: the invention of construction; a feedback phenomenon.
> EXPERIENCE: transformation of reality through perception.
> FREEDOM: a state emptied of pre-conceived value, use, function, meaning; an extreme state of loss within which choice is unavoidable; a condition of maximum potential, realized fully in the present moment.
> STRUGGLE: the essential condition of freedom.
> KNOWLEDGE: the invention of the world in all its complexity and multiplicity of its phenomena.

The winner of the future is not the one with the most toys, but the one who plays with them the best.

References

Grabe, M. and Grabe, C. (2001). *Integrating technology for meaningful learning, 2nd ed.*. Boston: Houghton Mifflin Co.
Jonassen, D. (2000). *Computers as mind tools: Engaging critical thinking, 2nd ed.* Upper Saddle River, NJ: Prentice-Hall, Inc.
Jonassen, D. et. al. (1999). *Learning with technology: A constructivist perspective.*. Upper Saddle River, NJ: Prentice-Hall, Inc.
Woods, L. (1991). *Terra Nova.* Tokyo, Japan: a+u Publishing Co,. Ltd.

Title: Integration of Informatics Concepts and Practices into an Existing University Curriculum

[subtitle: There's no way we can fit another course into this program!!!!]

Within a four year Baccalaureate program of Nursing Education, this educator is interested in successfully integrating several computer skills and a knowledge base of information about the use of computers in healthcare, known as nursing informatics. After five years of informally trying to get students in this nursing program "practice ready" with acceptable computer literacy, knowledge base and skills, this educator recognized the need to formalize the integration of four levels of computer knowledge and practice into the existing nursing program. This paper is the description of the results of that integration project. Although this presentation will refer to a nursing curriculum, these ideas could be relevant to most post-secondary courses where students need to incorporate computer skills into their programs as accessory to their professional development.

This short paper will briefly describe

- the rationale for integrating this subject material into the curriculum as opposed to presenting it in a 3 credit course format.
- the objectives for the exercises and assignments chosen to help students know and practice their computer skills
- the expectations of student performance at each of the four levels
- the faculty development necessary to implement the integration

This paper will be of interest to educators concerned with practical ways to:

- assess student computer comfort and skill levels,
- interest students in using computer skills, and
- prepare students to go out into their career with foundational computer skills and comfort with technological advances.

Resources available with this short paper presentation will include a sample of assignment criteria and guidelines for implementation of computer concepts and practices expected at each level.

The Advantages of an Active Text

Brian Felkel
Department of Mathematical Sciences
Appalachian State University
United States
felkelbh@appstate.edu

R.L. Richardson
Department of Mathematical Sciences
Appalachian State University
United States
richardsonrl@appstate.edu

Abstract: Business colleges have become increasingly disenfranchised with the way Business Calculus courses have been taught and with subject matter included within the course. Over the past year we have developed a text for our class that we make available on a CD. This provides much flexibility and allows us to implement several innovative ideas. Because the text is active, we have inserted hyperlinks to current web data sets that the students manipulate. We have also made compressed videos of examples and exercises found in the text. These videos are available on the CD and hyperlinks to the videos have been included within the text. These ideas could be generalized to courses other than Business Calculus. One could also use these ideas to make his/her own video tutorials without writing a new text.

Introduction

As mentioned in the abstract above, business colleges across the country are beginning to question the worth of Business Calculus as a required course. Several years ago the College of Business at Appalachian State University was among this group. It was then that the mathematics department started using Excel extensively in this course and started focusing on the needs of students in this course. Over the course of this last year the authors set out to improve upon this course by designing an innovative, new text entitled Networked Business Math.

The course already required extensive computer use with Excel and Maple, a computer algebra system. It was natural to try to make use of the power of computing in this new approach. The text, at the time this article was written, is a complete one-semester text for Business Calculus. It was first available via the web but is now available on CD.

Because this text requires the computer just to be read, we were able to make it an active text. Exercise sets at the end of each section have hyperlinks to solution sets. Exercises have hyperlinks to current data, e.g. census or labor statistics data, and thus these exercises remain current. The main innovation is that most examples in the text contain a hyperlink to a video file. This file shows students how to work the example and students can also work along with the video.

In this paper we will discus, in more detail, this text and its innovations. Students' reactions and comments will also be included. Finally, we will point out ways in which others can use some of these ideas without writing his/her own textbook.

Exercises and Solution Sets

Because the text is active, students have links within the text that access web sites containing current interest rates, current U.S. income data, labor statistics, census data, etc. This, of course, is an impossibility with a printed text. An example is included below:

Go to http://www.census.gov/govs/www/state.html and select a year for the Summary table. Download the "Summary Table Spreadsheet."

(a.) Using the state population as the x-coordinate and the total revenue as the y-coordinates, choose 5 states (not your own), plot the data, and find an equation of a curve of best fit.

(b.) Plug in your state's population and predict your states total revenue. How accurate was your prediction?

(c) Repeat a and b above with 20 states

Huge data sets, which are current and applicable to the majors, can be downloaded and then uploaded into Excel within a matter of seconds. As long as the census bureau updates their web page, this problem is a current problem. Also, some self-constructed data sets within the text have been embedded in such a way that students can copy and paste the data into Excel quickly and without copy error. This results in more instruction time and also allows for more intricate and detailed examples within the text.

The exercise sets at the end of each section also contain hyperlinks to solution sets. If the homework requires the use of Excel, the solution file is an Excel file. If the homework requires the use of Maple, the solution file is a Maple file. Because many students do not have a copy of the Maple software, html files can be accessed to show Maple solutions to the homework. These files are truly solution sets and not just answer sets. Students can explore and manipulate their files, in order to check their solutions and, of course, these files are included on the CD.

Video

As stated above, most examples have hyperlinks to a video file. A typical example has the following format:

Example 1: Copy the linear data above and find the line of best fit.
See sec1_4_1.qt. for a video on this concept.

These video files are included on the CD and must be viewed with Apple's QuickTime Player, a free download from Apple's web site.

These videos offer students and teachers many advantages. The pedagogical advantage is more classroom instruction time. If a course requires the use of computer software, classroom time must be used to teach the software syntax. Because the videos show the software "in action," students can see the syntax for themselves and view the cause-and-effect relationship of the commands. The instructor, therefore, does not have to re-explain the syntax, and more time is available for actual course instruction.

The students also reap benefits. These videos should appeal to the visual, auditory, or tactile learner. The students can run the video and software simultaneously. Therefore, a student can work along with the video and learn the material and the syntax. If the video progresses too quickly, the student can pause, rewind, or rerun the video.

These videos are also 24-hour tutors. Students do miss class from time to time or they just miss concepts while in class. Learning class material that has been missed can be difficult. With the use of these videos, students have some help to that end.

Response To The Text

On the lighter side students have commented that it is nicer to carry a 5-oz. CD as opposed to a 10-lb. book. Students who have missed class have pointed out that the videos were a tremendous help in learning missed material and keeping up-to-date with the rest of the dass. Student response to this approach has been quite favorable. In fact, two students led a departmental colloquium in April 2001, in which they discussed their (favorable) views of the text.

We have been using this text since January 2001. Since then, about 600 students have used this text at ASU and one community college teacher has used it during the Fall, 2001, semester. Because of the student volume and nature of the text, an (almost) typo-free text has been created.

Students' impressions and comments have been very positive thus far. They appreciate the fact that applicable topics are covered, and some students have reported to us that they have used Maple in other business classes. Because of the use of Excel and Maple, more "real-world" type problems and functions can be analyzed. Students have also expressed much appreciation for the videos and the benefits that they provide.

Generalizations

The authors realize that business calculus is not the only class for which computer software is used. Some of these ideas can be implemented into any class that uses computer software, without having to write your own textbook.

First, understanding how the videos are made is necessary. These videos were created with Snapz-Pro[2] , available at http://www.AmbrosiaSW.com, which is essentially a screen capturing software tool for Macintosh computers. For those using a Windows PC, a similar program, HyperCam, is available through Hyperionics. These programs allow the user to capture between 1 to 30 frames per second and embed audio. The authors use 5 frames per second and the file size is approximately 500KB per minute of video. Most videos are between 2 to 5 minutes in length so, as a result, video downloads are relatively short, even with a 56K connection. However, the computer that one uses to produce the videos needs to have sufficient speed and memory or the video will lag significantly behind the audio. The authors used a Macintosh PowerBook G3 with 333MHz and Mac OS 9.0.

Because this software is a screen capture, virtually any software can be videoed. With this software a teacher can produce his or her own videos and make them available via a web site. Videos less than six minutes in length can be downloaded relatively quickly with 28-56 kb modems. Thus, as long as students have internet access, they have video access. In fact, the authors first used this approach before the new text was written. The authors managed the course using WebCT and it was natural to use this as a storage area and access area for the videos.

Statisticians within the ASU Mathematical Sciences department have started using this type of video to model some statistical software. Instructors can make their own tutorials or work selected exercises from their current textbook. Instructors could write their own supplementary exercises and make them available through the web with links to video. There are many possibilities and instructors can make it as intricate or involved as they wish.

Conclusions

A textbook on CD should be more than simply a transfer of words from one file format to another. It should be an interactive textbook. Networked Business Math allows for this. With the click of a mouse students can access huge data sets or solution sets. With another click of a mouse students can access video and can participate by modeling what they see in the video. In this way the text is truly interactive and students can do much more than passively read the text. In fact, with many math texts students do not even engage in passive reading of the text. This text and style attempts to draw the student into active learning of the material.

As stated above, these approaches need not be confined to Business Calculus. Statistics software, geometry software, computer algebra systems, etc. can be explained through video. An instructor need only post their video tutorials in a web-accessible space and students have 24-hour help.

Web Design through Traditional Subjects

Joanne Fevergeon, Teacher
Ellensburg High School: Ellensburg, Washington
jfevergeon@wonders.eburg.wednet.edu

Anuja Dharkar, Curriculum Specialist
Macromedia: San Francisco, California
adharkar@macromedia.com

Abstract: Web design is a new subject for many teachers. Although Web design teachers have the ability to teach this course, they have not generally come from a Web design background themselves. Having the knowledge or background to teach such a course can be difficult. New teachers of Web design can draw from more traditional subjects, where they might have more expertise.

Web design requires understanding information and its underlying conceptual structure to create Web sites that convey the information in a way that promotes learning. Although it is a new communication medium, teaching Web design can provide an exciting method that combines traditional subjects with the latest communication technologies. Web design can be used to teach subjects such as History, Art, and English and vice-a-versa.

History

Students encounter large quantities of information on the Internet. To be thoughtful consumers of this information, students must learn to discern its validity. The research students conduct and the products they create for the Web also need to contain valid and justified content. Students can learn to assess validity by following the processes they use in other subjects such as history. For example, when documenting historical accounts, expert historians conduct the search for validity by verifying the authenticity of the source, checking for bias, and using corroborating evidence. Similarly, students can utilize these professional methods to distinguish valid Web information from false content. In this session, we will do a number of activities to judge validity by analyzing Web site information with respect to bias, sourcing, corroboration, and currency.

Art

Graphic design on the Web incorporates basic rules of design. Principles of art and design overlap when designing for the Web. Students can be taught traditional art methods to apply to the Web forum. Art principles such as color, balance and the rule of the thirds will help students better understand graphic design.

English

The Web contains written work that is different from writing for print work. The information on the Web must fit into a smaller space and capture the attention of the user immediately. When learning to write in English classes, the topics covered help students organize information and provide specific information. Differentiating these two forms of writing can help students better understand writing for the Web. Teachers linking Web writing to writing in English class can help students easily transition to Web writing. Learning to write for the Web differs, but having strong writing to begin with will help students transform their writing for the Web.

Conclusion

The transition to Web design requires the acquisition of new skills for teachers and students, however the transition can be made smoother by incorporating the use of traditional subjects. Web design, although a new field, can be taught in conjunction with familiar subjects that will produce similar skills. These skills can then be built up beyond their traditional roots.

A Comparison of Online and Regular Learning Contexts in a Course for Teacher Education Students

Asghar Iran-Nejad
Yuejin Xu
Educational Psychology Program
University of Alabama
United States
airannej@bamaed.ua.edu

Abstract:
This paper explores whether online and regular learning contexts differ in their influence in the course of a semester-long intervention aimed at changing the learning conceptions of the students enrolled a multi-section educational psychology course for teacher education students.

Introduction

Changing teacher's conceptions of learning and knowledge is currently viewed by teacher educators as an important component of pre-service and in-service teacher training programs (Cochran-Smith & Lytle, 1999). The way we conceptualize learning has a profound influence on the approach we may take in further learning and teaching. However, little is known about what affects the development of learning conceptions and how different learning conceptions interact with learning contexts and types of instruction. The study reported here explored a semester-long approach to teaching educational psychology to pre-service teachers aimed at getting them to reconsider their own conceptions of learning. The study also explored how well online cooperative learning contexts compare with traditional cooperative learning contexts. Additionally, we explored a new type of instruction which not only provided procedural learning opportunities but also opportunities for indepth grounding of student learning in their prior experiences.

Theoretical Framework

Iran-Nejad (1990) identified three qualitatively different levels of learning conceptions as reflected in existing learning theories. The first level is internalization of external knowledge by means of maintenance rehearsal in which learning is viewed as the storage of ready-made objects. The second level is internalization of external knowledge by means of constructive elaboration in which learning is more likely viewed as the construction of objects via ready-made patterns. The third level is the wholetheme reorganization of the learner's own intuitive knowledge base in which learning is like inventing new designs using one's own intuitive knowledge base. This third level was the goal of instruction for indepth grounding. Such instruction includes the interaction of multiple sets of factors. One set of factors influencing learning has to do with learner's own active and dynamic self-regulation processes (Iran-Nejad & Chissom, 1992). Another related set of factors results from interaction in social and cooperative contexts (Vygotsky, 1978). And yet a third set of factors deals with variables having to with the kinds of learning activities facilitated through instruction. In normal academic learning these factors are expected to work together naturally to bring about future learning. Moreover, following the biofunctional theory (Iran-Nejad & Gregg, 2001), we hypothesized that wholetheme learning facilitate the development critical learning.

Methodology

The students in six different sections of an educational psychology course for teacher education students were randomly (a) divided into groups of 4 to 5 students each and (b) assigned to two cooperative learning contexts. In one context, students met in regular groups in their classroom to engage in cooperative learning activities. In the other conditions subjects used the computer to interact using the same learning activities, computer forums, and online interaction using WebCT. In addition, the students in three of the sections were provided with procedural learning instructions. Students in the other three sections received procedural learning opportunities plus grounded learning opportunities aimed at wholetheme learning as defined above. A conception of learning inventory was used to measure changes in participants conceptions of learning. A multiple choice test measuring different levels of critical reflection was also used. Finally, the learning activities were compiled by the students into a reflective learning portfolio, which will be used as a source of qualitative data.

Results and Discussion

This paper reports the quantitative data from the learning inventory and the multiple choice test. Qualitative data is discussed in the presentation. The scores from each of the three subscales of the Conception of Learning (LC) inventory were summated. A mixed design ANOVA was conducted on the pre-test and posttest inventory scores with three levels of learning conceptions (LC1, LC2, LC3) as a within-subjects factor, two levels of instruction as a between-subject factor, and two levels of cooperative learning as a between-subjects factor. Would the participants in the computer cooperative learning groups in any form of relevant disadvantage as compared to those in regular cooperative learning groups. No significant main effect or interactions involving cooperative learning were found. The multiple choice test contained three types of items. Regular items measuring domain-specific content, critical reflection items based on domain-specific content, and critical reflection items measuring cross-domain inference. A potentially important finding was that the interaction between cooperative learning and instructional intervention was significant only for cross-domain multiple-choice items. No differences were expected between online and regular cooperative learning, and none were found. The finding that the participants in the grounded instruction did better in regular cooperative learning and worse in online cooperative learning was surprising. This finding is interesting, especially since the mean performance for both grounded instruction groups was higher than regular instruction groups.

Reference

Iran-Need, A. (1990). Active and dynamic self-regulation of learning processes. *Review of Educational Research, 60(4),* 573-602.

Iran-Nejad, A., & Chissom, B. S. (1992). Contributions of active and dynamic self-regulation to learning. *Innovative Higher Education, 17(2),* 125-136.

Iran-Nejad, A., & Gregg, M. (2001). The brain-mind cycle of reflection. *Teachers College Record, 103(5),* 868-895.

Cochran-Smith, M., & Lytle, S. L. (1999). Relationship of knowledge and practice: Teacher learning in communities. In A. Iran-Nejad & P. D. Pearson (Eds). (1999). Review of Research in Education (pp. 249-305, Vol. 24). Washington, DC: American Educational Research Association.

Vygotsky, L. S. (1978). *Mind in society: The development of higher mental process.* Cambridge, MA: Harvard University Press.

Technology overload: Are we meeting the needs of the individual student?

Steve M. Jenkins
Department of Psychology and the Behavioral Sciences
Louisiana Tech University
United States of America
Stevemjenkins@yahoo.com

Cathy Lott
Department of Psychology and the Behavioral Sciences
Louisiana Tech University
United States of America
catlott@aol.com

Walter C. Buboltz, Jr.
Department of Psychology and the Behavioral Sciences
Louisiana Tech University
United States of America
buboltz@latech.edu

Lamar Wilkinson
Department of Psychology and the Behavioral Sciences
Louisiana Tech University
United States of America
lamar@latech.edu

Abstract: Integration of technology and basic computer literacy into our colleges and universities is undoubtedly a necessity. However, little consideration in the literature has been given to specific needs of the student. Educators need to consider the level of incoming technology literacy, and career field of the student when implementing technology training to ensure that individual needs are met without overloading the student. Universities have a responsibility to insure that the integration of technology into courses is not done recklessly, and that all students have an equal opportunity for success.

In today's technology driven world, the integration of technology and basic computer literacy into our colleges and universities is undoubtedly a necessity. However, little consideration in the literature has been given to specific needs of the student. While some students may enter college with the basic technology competencies needed to successfully complete course work, others are often required to master technology that may have little relevance to their particular field of study. The level of computer experience and knowledge necessary varies drastically from job field to job field. Simply requiring students to acquire knowledge of a preponderance of software programs, may be a detriment rather than an asset to college students. In order to adequately prepare college students for a career, without overloading them with non-essential technological skills, universities need to focus on the individual student's specific needs. The main concerns addressed in this article are the relationship between course content, technical proficiency, and influence on social skills.

Virtually all employment opportunities for college graduates require (and even expect) a certain level of technological experience. To meet this challenge, many universities are either infusing the instruction of various computer programs into course curricula, or simply requiring the student to use a variety of technology mediums to complete assignments. Many universities now even require students to own or lease a personal computer that meets the universities' own recommendations. According to Harry Matthews, Chair of the Academic Computing Coordinating Council at the University of California – Davis, "computer ownership levels the playing field for all students" and also assures instructors that on-line assignments are accessible to all students (Justice, 2000).

The fact remains that not all students are on a level playing field. In 2000, only half of all college freshmen arrived on campus with their own computers. These college freshmen were proficient in using

Windows, word-processing software, electronic mail and the Internet (Olsen, 2000). Unfortunately, this suggests that the other half of college freshmen may not have the aforementioned proficiencies, and are at a disadvantage when compared to their fellow students that do own computers. Ultimately, the amount of time for the student to learn the subject material does not change. If the student is not already familiar with chosen medium, he or she may be faced with a significantly larger workload than the technological savvy student. Conversely, if the instructor allots class time for technology instruction, the result may be the subsequent omission of certain course material. There is a struggle been achieving a balance between technology, course content, and social skills learning.

There is no doubt that universities must ensure that students are technologically literate before graduating, since more jobs than ever before require proficiency in technology. Therefore, universities must make an effort to assure that all students are truly on "equal footing" throughout college, and can progressively grow together in their continued, expanded use of technology. An additional issue is the needs of non-traditional students. Many non-traditional students have part or full-time jobs as well as families at home. They simply do not have "extra" time to attend workshops outside of their regular classes.

The vast differences in the abilities of both traditional and non-traditional incoming students dictates a need for intervention. A computer proficiency assessment for incoming students, prior to admission, could identify a need for remedial computer instruction. A class in the use of microcomputers could facilitate an even playing ground for all students. Another way universities could address these needs is by covering computer literacy in freshman seminars as a part of adjusting to college life.

It is also important that the rapid infusion of technology into universities is not executed at the expense of social skills training. Careers in fields such as psychology, where face-to-face skills and the observation of non-verbal cues, are essential to success, an overemphasis on technology could be detrimental to the overall education of the student. According to Rogers (1992) "There must be a warmth of relationship between counsellor and counselee if any progress is to be made". For many individuals, learning the intricacies of computer software and technology may be considerably less important than daily social skills training and application. Early research by Gove and Geerken (1977) indicated that when people have more social contact, they are happier and healthier. Furthermore, research has indicated that there is a positive relationship between social skills and academic achievement (Feshbach and Feshbach, 1987). Universities that require instructors to implement technology into courses need to consider the student's social development and career path.

Today's college student is faced with not only learning traditional course content, but also required to attain proficiency at the use of a variety of technological mediums. Oftentimes professors are using technology such as a web page to supplement course instruction. Students who are less technology literate than their peers are either forced to spend additional "study time" learning how to navigate through a new web site, or forgo the web site material. Hence, if students are overloaded with learning technology, this may be accomplished at the expense of valuable course content. Technology overload may also be affecting the student's social skills training. Many careers require "face-to-face" rapport building skills. Courses that traditionally focus on this type of training may be less beneficial for the student, if class time is dedicated to technology instruction. It is not the intent of the authors to suggest that technological infusion is counterproductive to the student's education. However, universities have a responsibility to insure that the integration of technology into courses is not done recklessly, and that all students have an equal opportunity for success.

References

Feshbach, N. D., & Feshbach, S. (1987). Affective processes and academic achievement. *Child Development, 58,* 1335—1347.

Gove, W. R., & Geerken, M. R. (1977). The effect of children and employment on the mental health of married men and women. *Social Forces, 56,* 66-67.

Justice, D. (2000, Summer). Student computer ownership: A new statement of expectation. *IT Times*, 8(7). Retrieved from http://ittimes.ucdavis.edu/summer2000/ownership.html

Olsen, F. (2000, November 3). Campus newcomers arrive with more skill, better gear. *The Chronicle of Higher Education*, pp A41, A43.

Rogers, C. R. (1992). The processes of therapy. *Journal of Consulting & Clinical Psychology,* 60, 163-164.

The Dichotomy of the Conquering Hero: Searching for the Pedagogy in the Teaching of ICT

A C Jones, University of Sunderland, School of Education, Hammerton Hall, Gray Road, Sunderland, United Kingdom SR2 8JB
Email: chris.jones@sunderland.ac.uk

Abstract
There are I believe a number of approaches being taken to the teaching and learning of ICT in English secondary schools. Many teachers of ICT are not specifically trained in the subject and so are using tried and tested pedagogies borrowed from their own experiences in the teaching of the specialist subjects in which they were trained. Some of these teachers are imposing their own view of what ICT is about and how it should be taught. Some are recognising that ICT has concepts, knowledge, skills and abilities that need to be taught - but not being sure how to go about teaching these are falling back on a skills transmission model that is appropriate in vocational skills training but which under-develops the things that students 'need to know'. This paper looks at the strategies that are being employed and looks at where a perceived pedagogy for ICT is emerging.

Is there a pedagogy for ICT?

The teaching of ICT in secondary schools in England has been highlighted as having many weaknesses. Reports on the development and application of ICT in schools during the 1990s highlighted problems with resourcing and the slow-response times to new initiatives (Cox & Johnson, 1993. Stevenson, 1997). The OFSTED report which focused specifically on the inspection of IT teaching in England during 1995/6 identified IT as the least well taught subject in the curriculum (Goldstein, 1997). The situation has changed a little over time, but standards in ICT remain highly variable throughout the country; and do not compare favourably with standards in other subjects.

> Achievement remains unsatisfactory ... in one-quarter of schools in Key Stage 3 and in one-third at Key Stage 4. (Ofsted, 2001)

Goldstein (op. cit.) highlighted the need for the development of a critical pedagogy for ICT. In referring to a critical pedagogy he was mindful of the difference between the teaching of IT skills, the development of IT knowledge, the understanding of ICT concepts and the application of knowledge, skills and understaning in a variety of contexts. For each of these approaches to the development of capability in ICT teachers needed to be aware of the specific teaching and learning methodologies that were appropriate and should be critical and reflective in their choice of pedagogy. He reminded us, also, that in order for the pedagogical and managerial development of ICT as a subject to be successful schools would need access to "high quality national and local support" (p3). He goes on to say that:

> Lessons should be learnt from earlier stages of successful curriculum development in IT in this country, when such support entailed opportunities for teachers and teacher educators to sustain professional networks which addressed the teaching of IT and its uses in the curriculum (p3)

His message appears clear; without support and direction, teachers of ICT begin to "think that technology is the most important factor ... and overlook the pedagogical objectives' (Mason, 1998), and are deflected from starting to think about their practice in terms of appropriate theories of learning and teaching (ngflscotland). The 'technology trap' is one which is at once both appealing and dangerous: personal competency in ICT is a pre-requisite for pedagogical competency (you need as a teacher to know how to use the hardware and software to develop conceptual awareness), but the students in school need also to develop their personal competencies before they can use the ICT effectively as part of their learning repertoire - and as such you as the teacher can stick simply to the teaching of personal competency and not get into the development of conceptual awareness and understanding in your students.

There is certainly merit in that train of thought. Skill development often begins the process of conceptual development. The problem that we have with the teaching of ICT and the development of IT capability is that teaching and learning in ICT often does not go very much further than the teaching of skills based courses. So the pedagogy does not, very often, go much beyond drill-and-practice where students merely follow sets of instructions (or work through workbooks) which outline exactly which key presses and manoeuvres a student needs to go through in order to meet the defined task requirements.

The impetus for such approaches to teaching and learning in ICT derives from the technology itself and the pragmatism which lies behind the belief that functional competency in the use of the software alone is what constitutes an effective curriculum in ICT. The pragmatism here is one which ensures that students are successful in functional operations: they can do. They might not understand - but if we only test their abilities to carry out a limited range of operations then understanding is not necessarily important.

If we are to get any closer to a defined and accepted pedagogy of ICT (Goldstein, 1997) we need to analyse and define what is, or perhaps what should be taught as part of the ICT curriculum. We need to identify clearly the components of that curriculum and to identify and describe measures that need to be taken in order to ensure that the delivery of that curriculum is fit for the purposes we require of it.

In her analysis of teaching and learning in ICT, Webb (2000) identifies significant difficulties. The development and transmission of knowledge is "crucial to the pedagogical reasoning process" (Shulman, 1987), but in the ICT teaching community the match of experience and practice to the categories that Shulman defines is not a good one. It is clear from experience that many teachers of ICT lack a well defined subject knowledge (Preston, et al., 2000) and the definition of the subject in the National Curriculum specification for ICT, is couched in terminology which is generic enough to cope with the rapid changes in technology over time, but as a consequence has less clarity than other subjects. Webb (ibid.) analyses the relationship between the pedagogical content knowledge and how the subject itself accepts and utilises general pedagogical knowledge and concludes that they are:

> less well defined for ICT ... and the fairly limited research base of students' problems and misconceptions in ICT means that the knowledge of learners and their characteristics is limited.

This issue about the language of pedagogy and ICT is central to much of the debate, as is the dichotomous relationship between skills and concepts. Ofsted (op. cit) identifies the 'lack of systematic networking of leading teachers and schools' and those programmes which focus 'on the individual teacher's skills in using specific software' as being analogous with the failure to develop an 'effective subject pedagogy using ICT'. The tendency also to 'focus on technical matters' when supporting the role of ICT co-ordinators has undermined efforts to 'engage in professional and curriculum development' (p5).

Passey (1998) identifies a need for teachers to begin to see ICT in the same way that their students do, and in coming to see the technology as part of their natural teaching and learning repertoire will support their own development of a pedagogic competence in ICT. What is interesting in his view is that he firmly places the development of pedagogic competency before that of functional competency.

McCarney (2000) in summarising conference responses to the issue of pedagogy and ICT stated simply that 'there is a clear need to develop the pedagogy of ICT in the curriculum'. Grant (2001) also comments upon the lack of 'an agreed language regarding a pedagogy for ICT'. In doing so, she highlights the significant failure of the education community to deal effectively with the demands made upon it as a consequence of the development and application of a curriculum that is loosely defined and that is dependent on timely responses to technological change.

Identifying the language of the pedagogy is important here. Grant (op. cit), Goldstein (op. cit) and Webb (op. cit) all refer to the way we as teachers talk about and define what it is we are doing in terms of our teaching and learning. Part of this is about identifying clearly what we want our students to learn - the content of the curriculum; and a significant part getting to the 'agreed pedagogy' must be about identifying clearly how we should go about teaching this content.

Responses to technological development, be that the introduction of new hardware or the updating of software, often leads to a temporary de-skilling of the user and a consequent demand for specific operational training that is designed to support functional competency. A study of teachers' skill development in Greece (Makrakis, 1997) determined that personal skill acquisition are almost irrelevant without the development of pedagogical knowledge and understanding at the same time. In the context of Shulman's (op. cit.) knowledge categories competence in using ICT tools is skill application and demonstration without "the pedagogical organisation and presentation" (Makrakis, 1997 p167). Atkinson (1997) goes further and elaborates on the relationship between the technology and the potential for the development of a pedagogical construct indicating that technology lends itself to skills development without the concomitant development of underpinning concepts and knowledge:

> Technological systems are prone to under-theorisation and are often predicated on implicit pedagogical assumptions that do not necessarily stand up to rigorous scrutiny. (p 102)

Selinger (2000) acknowledges, in her analysis of the use of multimedia in schools across Europe, that "virtually all countries recognise that development cannot be effective unless attention is given to teacher training", and that any teacher training undertaken should focus in on the pedagogical application of ICT. Her analysis was further developed by Freeman and Holmes (2001) in their review of national policies for ICT. We have seen in England that the approach taken by the DfES to the development of teacher knowledge and skills in ICT through NOF training has come under criticism from Ofsted (op. cit.) and from teachers themselves (creativenet, 2000). This criticism lays the blame for the lack of appropriate development in ICT firmly at the door of the DfES. The "weakness of government in providing for change" was seen to exist, among other reasons, because there was a distinct lack of will to prioritise the teaching of ICT, and that in over half of schools ICT is neither fully implemented, nor evaluated (Jones, 2001 creativenet, op. cit.)

This lack of national vision and application is not a purely English phenomenon. McKenzie (1993) relates that, even after ten years of computers in American schools, "there is some evidence that we have failed to integrate the use of technologies by all teachers ... in ways that are meaningful, natural and powerful".

Plotting the route for finding both the perceived and projected pedagogies for ICT is not straightforward, though there are clear markers that we can lay down to help us to trace our route. Classroom mythology describes a situation in which enthusiastic students who are willing to learn and who enjoy the structured and staged approach to the development of ICT skills people ICT classrooms. The argument would continue to state that if children enjoy their learning and if we can see that there is a "greater improvement in ICT standards than in any other subject" (Ofsted, op. cit.) then there is nothing inherently wrong with the teaching and learning methodologies employed in ICT classrooms.

However well stated this argument might be the research into effective teaching (Hay McBer, 2000) identifies clear approaches for the development of successful pedagogy in all classroms that is not, as yet, being applied in ICT classrooms. The issue of in-service training is part of the solution, and should be focused not on the development of operational skills but on the pedagogical knowledge required to develop children's learning as fully as possible (Hemmings, 1998). There are other important issues that need to be drawn out here. The majority of teachers of ICT began, as I did, as teachers of other subjects and moved into ICT either as the curriculum changed and 'they had expressed an interest in it', or because they had a gap in their timetable that needed filling. As a consequence there is a large number of teachers of ICT as a specialist subject who have brought with them a pedagogy from their training and experience of teaching another subject. They have general classroom knowledge, but lack the content knowledge, curriculum knowledge and the pedagogical content knowledge (Shulman, op. cit.) to be fully effective in their roles. These terms are important in beginning to identify what it is about teaching a subject that is different for each subject, and are therefore central to the analysis of what it is that differentiates pedagogies. General classroom knowledge relates to the knowledge that teachers have which enables them to manage classrooms and to relate to the students that they teach. Content knowledge is equivalent to subject knowledge and should be seen as an important and essential partner to curriculum knowledge which is the understanding that the teacher has about the structure and content of the curriculum as defined by external agencies such as examination boards and the National Curriculum. What pulls all these strands together is the development of pedagogical content knowledge which exemplifies the whys and wherefores of how to teach the subject effectively.

There are difficulties too in that the National Curriculum specification for ICT is vague in its use of terminology, and is perhaps best described as a wish-list for student development in ICT. It describes what a student should be able to do, but not as in most other subjects, what they should know. This has led to the development of on-line, interactive or prescriptive schemes of skill development and application that foster a classroom pedagogy of what might be termed as 'ultra-facilitation'. Here the role of the teacher is purely that of monitor and assessor. It is the use of software that drives the learning; the focus on the task is supreme and the teacher's input to the lesson is minimal. Such approaches are, I would argue, part and parcel of the pedagogical dilemma facing teachers of ICT. There are 'successful' commercial schemes that offer certification and structure to teachers, schools and students which require very little in the way of actual subject knowledge on the part of any of the participants. Under these circumstances, why is pedagogy important at all? Schools can fill the students' time constructively, they can meet targets for student achievement, and they can deploy teaching staff effectively using existing resources.

One might counter this with the argument that quality assurance systems that monitor the effectiveness of the educational process will promote student learning and enable teachers to identify curriculum weaknesses and to move forward in a cycle of school self-improvement. This might well work in other curriculum areas but in ICT the inspection framework at school report level is not forceful enough in responding to its own judgements when schools are failing to meet National Curriculum requirements for ICT delivery (Jones, op. cit., Goldstein, op. cit., Ofsted, op. cit.).

There is a distinct need to develop the curriculum content of the ICT curriculum and to specify the range of teaching and learning experiences that children should expect to benefit from as a consequence of schooling. (Webb, op. cit.) This is beginning to happen since the publication of the QCA schemes of work for Key Stages 2 and 3. Very little analysis of the impact of these schemes has taken place. In a very quick hand count, of the 57 teacher trainees beginning their school practicum element in October 2001 only 4 were going to be involved in any form of teaching ICT in a framework which corresponded to that published by the Qualifications and Curriculum Authority. Subject knowledge is the main barrier here to pedagogical development and change in ICT classrooms. The focus on functional competency, which enforces particular pedagogical concepts such as drill and practice, could be minimised if teachers teaching ICT but qualified in other subject areas were "encouraged to study the theoretical aspects of the subject rather than focusing predominantly on practical issues" (ibid.).

The development of the ICT capable school, one which acknowledges the curriculum importance of ICT and which invests in the training and development of staff in ICT, is an important step towards defining the pedagogies appropriate for the ICT classroom. An approach to the development of ICT in schools has been identified by a UNESCO project (unesco, 2000) and has proposed four stages of school development and defined the learning pedagogy appropriate/characteristic of each stage:

	Emerging	Applying	Integrating	Transforming
Learning Pedagogy	Teacher centred Didactic	Factual knowledge based learning Teacher centred Didactic ICT as a separate subject	Learner centred learning Collaborative	Critical thinking and informed decision making Whole learner, multi-sensory, preferred learning styles Collaborative Experiential

Table 1. Approaches to ICT Development in Schools (ibid.)

This perhaps allows us to plan our journey. Many schools would however misinterpret the focus of the table and place themselves in a higher domain than would be appropriate based on an analysis and observation of teaching styles. If we build this model into the four stages of pedagogical informing (Woods, 1993) then we can see that, although the context is appropriate (ICT has dedicated suites), the lack of a fully defined content in the lower school, and the lack of open and grounded inquiry pose barriers to progression from one pedagogical domain to another. It is my belief that many schools would claim to be applying the concepts of learner-centred learning and that because ICT was already a separate subject that they were progressing from application to integration. Indeed, we can see elements of integration taking place as far as the facilities and resources are concerned, but in relation to pedagogical development most schools are stuck between emergence and application, and until teachers are more familiar with and confident in the concepts which underpin ICT they are not going to progress into the development of a pedagogy appropriate to ICT, and will continue to apply those pedagogies which are clearly not serving themselves or their students well.

References

ATKINSON, T. (1997) 'Pedagogical Considerations in the Application of New Technologies to Teacher Education' *European Journal of Teacher Education,* 20, pp 101-6

COX, M. and JOHNSON, J. (1993) *The Impact Report,* London, Kings College and DfEE

CREATIVENET (2000) What do teachers think about ICT professional development? http://www.creativenet.org.uk/immerse/eventSummary.asp?evID=4

GOLDSTEIN, G. (1997) *Information Technology in English Schools: A Commentary on Inspection Evidence*, Coventry, Ofsted and NCET

HAY McBER, (2000) *Research into Teacher Effectiveness: A Model of Teacher Effectiveness, Report by Hay McBer to the Department for Education and Employment,* June 2000, London, DfEE

HEMMINGS, P. (1998) *ICT for Serving Teachers, Cambridge*, RM plc

JONES, A. C. (2001) 'Two steps forward, three steps back: training teachers to teach ICT', Computers in Education, June 2001

LINN, M. C. and His, S. (2000) *Computers, teachers, peers: science learning partners,* London, Erbaum

MAKRAKIS, V. (1997) 'Perceived relevance of information technology courses to prospective teachers' professional needs: the case of Greece', *Journal of Information Technology and Teacher Education*, 6, pp 157-167

McKENZIE, J. (1993) 'Assessing Staff Technology Competence' in *From Now On: The Educational Technology Journal*, http://www.fromnowon.org/FNOMay93.html

McLOUGHLIN, C and OLIVER, R. (1999), Pedagogic roles and dynamics in telematics environments, in SELINGER, M and PEARSON, J. (eds.), *Telematics in Education: trends and issues,* pp 32-50, Oxford, Elsevier Science

NgFL Scotland (2000), Pedagogy and ICT, http://www.ngflscotland.gov.uk/newsandevents/reports/teic/teisummary.asp

OFSTED, (2001) ICT in Schools - the impact of Government initiatives, http://www.ofsted.gov.uk

PAPERT, S. (1993) *The children's machine: rethinking the school in the age of the computer,* New York, Collins

PASSEY, D. (1998) *Development of questionnaires for teachers to assess ict skills,* http://www.bteducation.com/sac_bt_education/htm/teacher/ict.htm

PRESTON, C., COX, M. and COX, K. (2000) *Teachers as Innovators: an evaluation of the motivation of teachers to use ICT,* London, MirandaNet

SELINGER, M. (1999) A critical analysis of the use of Multimedia in Primary and Secondary Schools, in SELINGER, M and PEARSON, J. (eds.), *Telematics in Education: trends and issues*, Oxford, Elsevier Science

SHULMAN, L (1987) 'Knowledge and Teaching: Foundations of the New Reform' in Harvard Educational Review 57, pp 1-22

SOMEKH, B. and DAVIES, R. (1991) 'Towards a pedagogy for information technology', The Curriculum Journal, vol 2 no 2, pp 153-170

STEVENSON, D. (1997) 'Information and communications technology in UK schools: an independent inquiry', London, SRU

UNESCO, (2000) Approaches to ICT Development in Schools, http://wwwedu.ge.ch/cptic/prospective/projects/unesco/en

WEBB, M. (2000) *Pedagogical Reasoning: issues and solutions for the teaching and learning of ICT in secondary schools*, unpublished paper presented at the ITTE conference, Swansea, July 2000

WOODS, P. (1993) The Magic of Godspell: the educational significance of a dramatic event, in GOMM, R. and WOODS, P. (eds.) *Educational Research in Action,* London, PCP

Title: Graphic Conceptual Organization: Metaphorical Representations of Understanding Within a Conceptual Framework of Understanding

Authors:

Robert Jones
University of Houston-Clear Lake
Houston, Texas
jonesr@cl.uh.edu

Caroline M. Crawford
University of Houston-Clear Lake
Houston, Texas
crawford@cl.uh.edu

Ruth Gannon-Cook
University of Houston-Clear Lake
Houston, Texas
gannoncook@cl.uh.edu

Jana Willis
University of Houston-Clear Lake
Houston, Texas
willis@cl.uh.edu

Topic: Concepts and Procedures

Abstract:

Unlike the highly individualized mapping process developed and popularized by Novak and Gowin, the Jones-Steinbrink model produced invariant maps with recognizable conceptual patterns. This outcome allowed researchers to produce concept maps and related instructional materials in an orderly, systematic manner that allowed students to efficiently and effectively learn the concepts presented in science and social studies lessons.

Proposal:

This paper presents a summary of the research and development efforts in graphic conceptual organization of curriculum materials conducted at the University of Houston-Clear Lake by Robert M. Jones and John Steinbrink during the 1980s. In a series of projects conducted by masters degree candidates, they were able to identify and validate four basic conceptual patterns in nonfiction science and social studies textbooks. Using the four basic patterns which they labeled main idea-supporting detail, summary and generalization, process or sequence and cycle, they and their graduate students were able to conceptually map all lessons and chapters in contemporary science and social studies textbooks. Unlike the highly individualized mapping process developed and popularized by Novak and Gowin, the Jones-Steinbrink model produced invariant maps with recognizable conceptual patterns. This outcome allowed researchers to produce concept maps and related instructional materials in an orderly, systematic manner that allowed students to efficiently and effectively learn the concepts presented in science and social studies lessons.

The graphic technology software available in the late 1980s consisted mainly of drawing programs and each individual element of the concept maps had to be drawn. Jones developed a series of coded templates in an attempt to improve this situation but the process was still slow and expensive in terms of human resources and time. This resulted in the development of only a small number of demonstration lessons and units. The technology was so complicated and time consuming that researchers found it easier to hand draw the maps using flow chart templates.

Recently several new generation programs with excellent conceptual mapping capabilities have been developed and are currently readily available for use by curriculum workers and teachers. This paper presents several lessons from a contemporary science textbook that have been conceptually mapped using the Inspiration software. Lesson concept maps with reading organizers, conceptual worksheets, aligned review and assessment tasks and other graphic teaching/learning products are presented. These products utilize the Jones-Steinbrink patterns and can be easily constructed using Inspiration. In addition to solving the technology problem faced by the earlier generation of researchers, the current software allows the instructional materials to be quickly and efficiently produced.

The Inspiration software also allows for the utilization of advanced interactive techniques that were conceived of but could not be demonstrated by the early researchers. For example, the lesson concept map can be presented in an uncluttered manner using only a few descriptive words for each conceptual element. By using the note feature of the software, each element can be opened to present descriptive text to the learner. This should allow for focused reading and concept pattern recognition by learners. Numerous other features of the software and their use in conceptually organizing curriculum materials are currently being investigated. These are presented and discussed.

Focus First: Strategic Planning and Front-End Development of an Online Teacher Resource

Cathy Bonus Lalli
Northeast and Islands Regional Educational Laboratory
The Education Alliance, Brown University
United States
Cathy_Lalli@brown.edu

Abstract: This paper addresses the critical steps that contribute to the strategic planning and front-end development of a new Web site. The process included an interdisciplinary team that worked to define the project in terms of purpose, objectives, target audience, and style, using modified versions of established Web development guidelines. The team also gathered information that would define and prioritize the content. This process was undertaken in a way that economized limited resources in the early stages, but allowed for future expanded development.

Background

As part of a contract award from the U. S. Department of Education, the Northeast and Islands Regional Educational Laboratory (LAB), a program of The Education Alliance at Brown University, agreed to develop a Web site entitled "Teaching Diverse Learners." This award was due in part to The Education Alliance's expertise in the areas of equity and diversity and a long history of technical assistance experience that has contributed to the knowledge-base of effective practices in classrooms, schools, and districts.

Preliminary Planning

An interdisciplinary Web site action team was assembled to begin defining the project. The team, consisting of equity and diversity experts, an editor, and an educational technologist, followed a modified version of Web development guidelines ((Lynch & Horton, 1999; Burdman, 1999; IBM, Design section, Web Guidelines). The task of planning the site began by addressing the strengths of the organization. Based on these strengths and informed opinion, the Web site action team drafted a rough mission statement and tentative objectives for the potential site. Then, a competitive analysis of nearly 100 equity-related Web sites was conducted to identify their purposes, nature of content, and intended audiences. This information was used to identify gaps among existing diversity Web sites and to align a gap with the expertise of The Education Alliance, in an effort to avoid a duplication of existing resources.

From the results of this analysis, the action team discovered that there was little information available to assist teachers of English language learners (ELLs) in the classroom. With this information, the team was able to identify the primary target audience for the Web site and to modify its purpose and objectives.

Needs Identification

Once the primary audience was identified, the action team administered a needs assessment survey to define user interests and needs. Surveys were distributed to teachers through Equity Assistance Centers across the country. The results of the survey would drive the content to be developed, help in setting measurable strategic goals for the site, and inform the final refinement of site purpose and objectives.

At the same time, the action team discussed design concerns with the technical development team. These concerns were around the issues of accessibility across platforms, older hardware and software, and dial-up connections. All team members had a clear understanding that this site would be designed in a minimalist style that would maximize access for those using low-end technology. In addition, the team established that the content would be developed in a Web-friendly style that was clear, concise, direct, and professional.

These steps were essential to finding the focus that would guide the production process of a new Web site. They provided a solid foundation for defining the audience, purpose, and style of the site, and continue to be used to guide ongoing content development.

Site Development

Priorities for first-year development included a simple architecture that would adapt easily for future expansion. The content development of the site and the maintenance of its interactivities were initially undertaken with limited resources. Therefore, a "Layers-of-Necessity" model (Tessmer & Wedman, 1990) was adopted for the site in order to facilitate a modest launch and to accommodate future development, as additional resources became available. In addition, the minimalist style of the site in its initial stages was consistent with the evolving concept of the model from simple to complex over time.

The efficient use of time and resources limited the extent of testing in the early stages. Prototype and user testing were economized (Nielson, 1999; Tessmer & Wedman, 1992) in order to focus time and expertise on content and technical development. However, user reaction to the prototype helped to guide the development of usability heuristics for the final product.

Summary

New technologies have simplified the development process for Web sites, making it possible for anyone with a computer and online access to author a site. The downside of this convenience is a proliferation of well-meaning, but unfocused sites. Strategic planning for the "Teaching Diverse Learners" Web site provided a definition and blueprint that served as a foundation for the initial and future development of the site.

The steps included:

1. Forming an interdisciplinary action team to define the project
2. Identifying the strengths of the organization and drafting a rough mission statement and objectives for the site
3. Conducting a competitive analysis of related sites
4. Identifying a gap in existing resources and aligning the gap with the strengths of the organization
5. Defining the niche and target audience
6. Assessing needs and interests of target audience to identify and prioritize content
7. Refining purpose and objectives
8. Determining design concept, style, and strategy for technical development of site
9. Soliciting user reaction to the prototype design to guide product development
10. Defining user heuristics for the final product.

References:

Burdman, J. (1999). *Collaborative Web development.* Reading, MA: Addison-Wesley Longman, Inc.

IBM's Ease of Use Web Site. (n.d.). Retrieved December 30, 2001, from http://www-3.ibm.com/ibm/easy/eou_ext.nsf/publish/572

Lynch, P.J., & Horton, S. (1999). *Web style guide.* New Haven: Yale University Pres..

Nielsen, J. (2000). *Designing Web usability.* Indianapolis: New Riders Publishing.

Tessmer, M., & Wedman, J. F. (1990). A layers-of-necessity instructional development model. *Educational Technology Research & Development, 38* (2), 77-85.

Tessmer, M., & Wedman, J.F. (1992, April). Decision-making factors and principles for selecting a layer of instructional development activities. *Performance & Instruction, 32* (4), 1-6.

Teaching Multimedia Design Using the "Tri-Component" Scenario Model and Associated Methods

Jean-Marc Laubin
Laboratoire des Sciences de la Communication
Université de Valenciennes et du Hainaut Cambrésis, France
jmlaubin@calasoft.com

1. Introduction

Despite the fact that many computer science students master complex techniques, like programming and technology integration, they are still unable to cope with the demands of multimedia project design. Clearly more emphasis should be placed on concept development given that content production is more a question of good ideas and targeting, than pure technical expertise.

The first part of the paper examines the challenges that the behavior of inexperienced students poses when they start to create a multimedia application. The second part looks at the basis of what makes up a multimedia application and the way in which its design is taken into account by our "tri-component" scenario model and associated methods. The final part demonstrates how using this method can help teachers deal with some of the challenges of teaching multimedia creation.

2. Problems Encountered by Students Starting a Multimedia Project

2.1 Misidentification of the scope of the "multimedia" concept: When asked, "What does the word 'multimedia' mean to you?", my computer science students regularly use one of the following answers: images and sounds on a computer; images, sounds and texts on a computer; images, sounds and interactivity on a computer; or images, sounds, texts and interactivity on a computer. The example of books, and more particularly roleplaying gamebooks (e.g. http://directory.google.com/Top/Games/Roleplaying/Gamebooks, retrieved 12/27/2001), is usually not identified by students as a possible "multimedia" system. Then there is the case of my engineering students who thought they were creating "multimedia" products because they were producing a 3-D film.

In fact, the use of images, sounds or even the computer are criteria that are neither necessary nor sufficient to define the specificity of a "multimedia" system, as will be defined below (section 3.1).

2.2 Inappropriate vocabulary for communicating within a team and misidentification of project levels: The word "interactivity" is used very often and with different meanings leading to frequent confusions such as the mixing of several phases of work. The word "interactivity", for example, is used in place of "interface elements" (e.g. "Here the interactivity is a button that can be clicked"). In fact, the concept of interactivity is related to the nature of messages exchanged and not to the way they are emitted or acquired.

2.3 Confusion between specification and implementation: Very soon into the project many of my computer science students verbalize their intentions, for example, by saying things like "the user can click a 'Stop' button to exit the activity". This kind of specification already suggests an implementation (a button). The problem here is that this over-hasty decision may not necessarily be the most effective one.

2.4 Omission of the specification phase: Using a non-directive approach (Rogers 1973), one of my three students groups, last year, was working on the subject "What can an adaptive Web-TV be?" and they encountered several problems in not following the recommended method. Error 1: Due to an inappropriate definition as to the nature of multimedia, they had decided, without further reflection, that a Web-TV is a mere Web site where users can view videos on demand which could possibly be "interactive". Error 2: In Week 2, I discovered the students had shot some videos without a written out script. They had rushed to the camera because, it seems that, it was an "attractive activity". Error 3: Having first neglected to create a scenario, the students finished with tons of unused rushes and presented an incomplete reply to the initial question, resulting in a good final report but a very poor prototype.

3. The Tri-Component Scenario Model

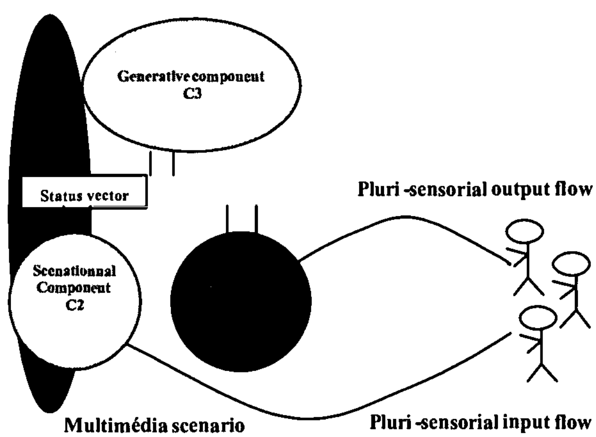
3.1. Basis of the model - an operational definition of multimedia applications based on their communicational functions: «*A multimedia application is a conceptual activity consisting of a pre-formatted informational content and allied explicitation procedures. It is destined to be exposed to the meaning and actions of one or of several interactors via an interactional*[1] *loop. This is made up of two non empty information flows, one of which enters while the other exits, each of which consists of one or several mono- or pluri-sensorial canals* » (Laubin 2001).

3.2. The structural outline of the tri-component model: The model of representation of, what can be called, the "tri-component scenario model" (Figure 1) ensues directly from the above definition of "multimedia" and is proposed for the design of multimedia projects, both as a methodological aid and as a basis for software tools that implement it. The model is influenced by the work on "Multiple Intelligences[2]" (Gardner 1996) and covers all the design aspects of the *Scenistic Approach* (Leleu-Merviel, Vieville & Labour 2002).

The multimedia product is presented as a communicational[3] object with particular features that can link up interested parties (authors and interactors) in an asynchronous way. The schematic representation of the tri-component scenario model is a direct transposition of the definition as a formalized model of setting the scene (*scénarisation*) after having taken into account two current features of multimedia applications. These features are not linked to the definition, as they are absent in certain cases (namely in books), but they have demonstrated their qualitative importance (Durand et al.1997b) in the two following ways.

First, there is the capacity to memorize a context when the work is put into practice (namely the paths of the interactor) without which one would have to list exhaustively all the possibilities of the scenario. This leads to a myriad of combinations in the number of situations that could be described, and in so doing this can hamper the author's work. This necessitates a "status vector" (see section 3.4 below) in our model.

Second, there is the crucial element that characterizes the ability of multimedia applications to change the content of their memory according to specific rules. These rules can be related or not to the interactor's behavior and necessitates a generative component in our model.



Besides the three components (Fig. 1), the scenario includes a formalised description of the data collection as well as the structural specifications (the document is broken up into fragmented elements logically organised at different levels).

There is also a status vector that is the only mechanism of memorization and inter-communication available for the three components.

The interactional loop is entirely defined by the expositional and scenational components (C1+C2) which describe the input and output flow of information of the external canals of communication.

Figure 1. Structural outline of the tri-component model

[1] Definition: By *interaction* is meant a series of exchanged "messages" between interactors in a given "communicational" (see below, Footnote 3) context (Watzlawick, Helmick & Jackson 1967, sections 2-2, 2-41). The concept of interaction can also be defined as a "system", where interactors are engaged, or have engaged, in defining (negotiating) the nature of their relationships (*idem*, section 4-22).

[2] The point being that intelligence is not unitary but complex and multi-facetted. For Gardner a human being can be intelligent in various ways, and this includes linguistic intelligence, musical intelligence, logical-mathematical intelligence, spatial intelligence, bodily-Kinesthetic intelligence, intra-personal intelligence, and inter-personal intelligence.

[3] Definition: For Watzlawick *et al.* (1967, sections 2-23, 2-34) *communication* is not just transmitting a message. It also implies a certain level of commitment and is defined in the way the sender sees his/her all-encompassing relationship to the recipient of the message.

The expositional component (C1, see fig 1) describes all that can be sent to the interactor. This is done by way of basic directives that send signals to different output canals. The proposed model is very open, and does not specify the way the basic directives must be described. This can refer to the corpus data of a multimedia product. For example, "Play IntroSound on the Sound output canal N° 2", or "Display film Intro.mov on the help window of the main screen", or even "emit smell maritime_pine.od for 10 seconds on the Smell output canal".

The scenational component (C2, see fig 1) (Durand et al. 1997a) describes the potential flow of information from the interactors to the multimedia application. This is done by using the notion of an "actional link" (what the interactor can do) defined in terms of four major elements: a) a condition under which the link exists, expressed in terms of the status vector; b) the title of the link; c) the consequence of the link; and d) as an option, the appropriate communication canal (if not present the link is said to be "abstract"). The consequence of the link lists the ways, by the order of priority, that the application can react to an interactor's choice. Each case is described by a context (conditions about the status vector), by the new resulting fragment and by the modifications of the status vector.

The generative component (C3, see fig 1) describes the rules of intrinsic development of the multimedia application. It is essentially made up of fragments called "generators" that do their work as background tasks and can require complex calculations. Basically they can read and modify the status vector or modify the corpus data used by the application. The proposed model remains open without specifying the way of describing the generators. Besides the generators themselves, the generative component also includes the activation instructions of the generators.

3.3. Structure of the scenario document: Without entering into details here, the scenario is broken up into fragments, which consists of the basic communicational unit. One can distinguish two types of fragments. First, the "Multi" fragments are linked to the interactional loop and can contain the directives of the expositional (closely linked to the notion of audiovisual scenario) and interactional components, as well as the activators of generators of the generative component. Second, the "Gen" fragments are the generators themselves that cannot send or receive signals to and from canals, but modify the internal state. There are also, two mechanisms to structuring the scenario document, one is supra-fragmentary (chaptering) and the other is intra-fragmentary (temporal synchronization).

3.4. The status vector, mechanism of communication of the three components: The purpose of a status vector is to memorize all information that needs to be kept or transmitted among the components. It is through it that one can see the idea of synchronization among the different components. The status vector is made up of seven sections to administer various elements from contexts that are different in their very nature. Each section can be read or updated by different components in a very precise manner, but this feature cannot be gone into in this paper for reasons of space. Suffice it to say there are:

• Two sections concerned with the profiles of the interactors:
  * *The constants of the profile* (or interactional constants) e.g. "I am a certain age"
  * *The variables of the profile* (or interactional variables) e.g. "User never chooses red links"

• One section concerning rhetoric control:
  * *Global evaluation statements* e.g. "Acquiring the notions of chapter 3 done"

• Two sections are concerned with the manipulation of data by the different components:
  * *States of the communication canals* e.g. "No sound received on input canal Sound N° 1 for 48 sec."
  * *Content Variables* e.g. "Key to room X in inventory", "Chapter 3 consulted"

• Finally, two sections deal with the follow through of the interactor's path, and serve to memorize the presence, the order, or the number of the passage of given fragments. The situation is modified by the two components that administer the interactional loop, while the histories are automatically generated without any intervention from the three components.
  * *Situation* (current fragment)
  * *Instant history and statistics* e.g. "Link # x of web page xx.html selected seven times

4. Contribution of the Tri-Component Model to Teaching Multimedia

4.1 : How does the tri-component model help solve the problems we have identified?

Misidentification of the scope of multimedia: Our model establishes clearly the type of product that students have to take in account in creating a multimedia project. The model is closely linked to a systemic approach for designing multimedia products. It can also help to ensure the successful achievement of pedagogical goals: The status vector description is essential and allows one to check if students have a real understanding of the situation that they are building. Interactors' actions should have multi-level goals, and both the control and communication processes have to be well defined, the former by the generative component and the later by the expositionnal and scenational components.

Inappropriate vocabulary for teamwork and misidentification of project levels: Returning to the example used in 2.2, as part of a *Scenistic Approach*, the "tri-component" model allows for a more unambiguous and appropriate vocabulary among team members, for example, "The user will have the ability to stop" (abstract input channel, primitive at scenario level). For this purpose the interface is a mouse-clickable area on the screen (interface level) in which a message "Stop" must be displayed (output channel, primitive at scenario level) taking the form of a button with the text message as title (implementation or production level).

Confusion between specification and implementation: One can enrich the interface level by a verbalized choice (using voice recognition technology) with everything else staying the same. Taking the example above, the interface is both a mouse-clickable area on the screen, and a verbalized choice that recognizes the word "Stop" (interface level). In this way one can present a unique abstract scenario with several possible implementations.

It is vital to ask students to start with writing a scenario first so to help them focus on the design and to split their work into smaller and simpler tasks. The scenario can eliminate the dangers of students "designing as they go along" and it allows subsequent evaluation, both by the teacher and by students, to see if the implementation is happening according to the initial specifications or not.

Omission of the specification phase: In Week 2, the "Web-TV" group's work was partially saved by an in-depth explanation of the "tri-component" model and then by asking them to produce the required scenario documents to guide the team along for the rest of the tasks to be done.

4.2. Discussion

In this section we present how our model is used and how it compares to several other works. At the very beginning of a project, or preferably one month before it starts, the «tri-component» model can be presented along with a classification of the various cases of the interactional loop (interactional degree), of the generative component (generative degree) and the ability to use and recontextualize parts of the information.

The student's projects are organized at a group level, with each group having 12 to 14 students. The whole project is conducted as a situational problem (Delattre 1993, Dewey 1938/1968) which has a very general theme as a starting point and whose final goal is to produce a working prototype. The pedagogical aim is to construct knowledge by self-discovery and by using several kinds of tools in being aware of constraints, limits and errors. It also involves measuring the gap between intention and final result. Every step is learner-centered with the teacher having to continuously reevaluate the degree of success, the quality of the communication within the students group, the needs of specific tools (software, development kits, computers and audio-visual equipment). The main difficulty for the teacher is to guarantee the right type of success for the project, and in some cases s/he has to convince the students to break down their objectives into smaller, more manageable ones. This approach, inspired by Bruner[4] (1966), has proven successful with six groups during the last two years.

The tri-component method is used at the beginning of the multimedia creation course and is compared to methods dedicated to design work like those of Landow (1994) and Levy (1992). Our method offers an easier teaching framework. First, the students note down all their ideas in an unstructured document. Second, the students fill out a skeleton scenario to cover all the required aspects reusing their initial ideas. Third, the students add any missing content. Fourth, they define in detail the status vector content and associated tasks (communication, rhetoric control, etc.). Fifth, the scenario is validated by simulation tests. All these steps are then iterated (spiral method).

The tri-component model formalizes the writing constraints of the objects in the designer's universe (places, characters, objects, etc.) and their interaction with the user. It also allows a pragmatic and step-by-step work on the multimedia product. Another very important point is the syntax of the language used to support the model that provides a scenario-based approach *viz.* Wimberley (1996), Garrand (1997). However, their scenario models are not appropriate and need alternative choices (Laubin et al. 1999). The chosen format and syntax for our underlying *ZebraWriter language* (Laubin et al. 1999), whose updated specification will be published later this year, satisfies the following characteristics, in order of importance: easy reading, self-explicatory text, good simulation capacity, a good navigation capacity, easy update procedures, tool for structuring and rhetoric construction control. The next step will be to introduce into the project process a writing and prototyping software that implements the *ZebraWriter* language and provides various functions for scenario analysis and validation.

---

[4] For Bruner (1966) a theory of instruction should: (1) be focused on learners' needs, (2) present a body of knowledge in a way that is understandable to learners, (3) propose a systematic approach to presenting instructional resources and (4) be clear about the system of rewards and sanctions.

The method can also be applied to teacher education both for inexperienced multimedia teacher in the same way as described above for students as well as for inexperienced teacher wishing to produce a multimedia version of their courses. Indeed for this latter case the tri-component method can enhance existing constructivist inspired pedagogical approaches.

5. Conclusion

The underlying idea of using the "tri-component scenario model" for multimedia teaching is to ensure a good methodological environment for helping the teacher and the students to succeed in a very open situation-problem. In these kinds of projects the most important is not the result but the encouraging the appropriate strategies to achieve set tasks, such as to:

a) explore a multimedia problematic (ability to construct step by step from scratch and to later structure and refine)

b) delimit a feasible goal according to the time given (the fragmented structure help identify and measure sub-tasks)

c) organize the work and communication within the student groups (the scenario is a common specification and reference document)

d) finalize an actual multimedia work done (the use of *ZebraWriter* associated language provides a prototype on paper without any other work and production steps can start fairly late when the prototype is fully validated)

Abstract: During the last two years as a project coordinator of computer science students experiments were conducted into the teaching of multimedia design. This has led to the observation that many students are not able to cope with the initial phase of designing a multimedia project. Our proposal for solving this basic problem is based on a constructivist approach related to the *Scenistic Approach* in our research laboratory. The approach is learner-centered and focused on strategies that students develop for the project. Learners start with a step -by-step creation of a detailed scenario that they wrote for a multimedia application according to the "tri-component formalized model ". The second phase is the realization of the project when the group has to organize itself according to the diverse abilities of its members. For the future these methods appear to be particularly useful for experienced teacher educators in the multimedia arena.

References

Bruner, J. (1960). The process of education. Harvard University Press, Cambridge.

Bruner, J. (1966). Toward a Theory of Instruction. Cambridge, MA: Harvard University Press.

Delattre, J. (1993). Situation-problème, faisons le point. *Spirales 10/11*, 1993, p7-26.

Dewey, J. (1938/1968). Expérience et éducation. Armand Colin, Paris.

Durand , A. & Huart, J. & Leleu-Merviel, S. (1997a). Vers un modèle de programme pour la conception de documents. Paris, Hermès, Revue internationale *« Hypertextes et Hypermédias »*, Volume 1 n°1/1997, 79-101.

Durand, A. & Laubin, J.M. & Leleu-Merviel, S. (1997b). Vers une classification des procédés d'interactivité par niveaux corrélés aux données. Paris, Hermès, Revue internationale *« Hypertextes et Hypermédias »*, Volume 1 n°2-3-4/1997, 367-382.

Gardner, H. (1996). Les Intelligences multiples, Paris, Retz,

Garrand, T. & Samsel, J. (1997). *Writing for Multimedia*. Boston, Focal Press.

Landow, G.P. (1994). *Hyper/text/theory*. Johns Hopkins University Press, Baltimore & London.

Levy, P. (1992). *De la programmation comme l'un des Beaux Arts*. La Découverte, Paris 1992.

Laubin, J.M. & Escarabajal, M. & Leleu-Merviel, S. (1999). Formats de scénarios : méthodes et outils pour l'écriture interactive. Paris, Hermès, Revue internationale *« Hypertextes, Hypermédias et Internet »*, 159-183.

Laubin, J.M. (2001). Ecriture multimédia : le modèle de scénario tri-composante. Paris, Hermès, Revue internationale *« Hypertextes, Hypermédias et Internet »*, 97-112.

Leleu-Merviel, S., Vieville, N., & Labour, M. (2002) *Using Pedagogic Scenarios b Optimize Pluri-Media Resources: The Contribution of the Scenistic Approach to Designing Skills-Based Learning Tasks*. SITE 2002. Nashville, Tennessee, USA.

Rogers, C. (1973). Liberté pour apprendre, Paris, Dunod, 1973.

Watzlawick, P., Helmick Beavin J. & Jackson D.D. (1967). *Pragmatics of Human Communication. A Study of Interactional Patterns, Pathologies, and Paradoxes*. New-York, W.W. Norton & Compagny, Chapitres 2 et 4.

Wimberley, D. & Samsel, J. (1996). *Interactive Writer's Handbook*. San Francisco, Carronade Group.

Exploring the "Why?" of Educational Technology

S. George Mastroyanis
School of Education
University of Alaska Anchorage
United States of America
afgsm@uaa.alaska.edu

Abstract: The I.T. skills needed by the students we teach demand experiences which are outside the educational mainstream.... (We need) an education commensurate with each student's ability to learn. (Sandra Kaplan)

My session seeks to focus on the individual relationship between the teacher and each student, with special reference to Martin Buber's "I-Thou" relationship and to move away from the I-it/I-them" way of education. This is the means to fulfill any student's greatest need - to be loved and respected for who they are - an individual person who is different. It is my convinced belief that this is the starting point in serving students effectively to enable both the teacher and the individual student to make meaningful contributions for the future. It is in fact to fulfill the conference's goal as expressed in its title. In the interactive session, I will begin by inviting the teachers to examine the assumptions that underpin their philosophy – with special reference to their understanding of reality, truth and values in their own lives and then in the lives of their students. In this connection, educators will be challenged to be aware of the importance of relevance for the future and also discuss ways to determine each student's needs for the future.

When these have been explored, then, their relationship to education, with particular reference to the conference's educational goals, content, method and values, will be dealt with in detail. In view of the wide range of geographic, social and economic backgrounds of teachers attending the conference, (and the students they serve) each teacher will be assisted to create a one page summary that can serve as the basis of their educational technology philosophical framework to ignite their students' potential at their schools. The session will encourage each teacher to harness personal qualities, interests, experiences and expertise to create this clearly defined framework and, at the same time, be flexible to meet the needs of a diverse population. Accordingly, the essence of the session is to place excellent and relevant tools in teachers' hands -- tools that can equip them with the knowledge of what clear plans to utilize in serving each individual student.

I am convinced that the "why" of education greatly facilitates and enriches the "what" of education and technology.

Promoting Student Inquiry: WebQuests to Web Inquiry Projects (WIPs)

Philip E. Molebash
San Diego State University
United States
molebash@mail.sdsu.edu

Bernie Dodge
San Diego State University
United States
bdodge@mail.sdsu.edu

Randy L. Bell
University of Virginia
United States
randybell@virginia.edu

Cheryl L. Mason
University of North Carolina, Chapel Hill
United States
clmason@unc.edu

Abstract By the earliest definition (Dodge, 1995) a WebQuest is "an inquiry-oriented activity in which most of the information learners work with comes from the web." WebQuests are defined first as being "inquiry-oriented," but are they truly an example of inquiry or are they something else? The majority of WebQuests fall under Herron's (1971) category of structured inquiry, but there are higher levels of inquiry desired by educators that are difficult to promote using the WebQuests model. Based on a spiral path of inquiry, Web Inquiry Projects (WIPs) are designed to promote such higher levels of inquiry, specifically Herron's levels of guided and open inquiry.

Introduction

In early 1995 the WebQuest was developed by Bernie Dodge and Tom March as a way to help learners focus on using online information rather than looking for it. By the earliest definition (Dodge, 1995) a WebQuest is "an inquiry-oriented activity in which most of the information learners work with comes from the web." WebQuests are defined first as being "inquiry-oriented," but are they truly an example of inquiry or are they something else?

Defining Inquiry

The answer to this question might depend on how you define "inquiry." It has been said that if you ask ten different educators to define "inquiry" you are likely to receive eleven different definitions. In an effort to produce a definition that represents the needs of every content area, the Exploratorium Institute for Inquiry (1996) developed the following definition: "Inquiry is an approach to learning that involves a process of exploring the natural or material world, that leads to asking questions and making discoveries in the search for new understandings."

An inquiry approach to learning can look markedly different depending upon content area. In the social studies, inquiry might require learners to analyze primary source materials in developing an understanding of historical events and how they are relevant to today. Inquiry in science might involve learners in observing and describing some natural phenomenon that is new to them, or in testing scientific hypotheses through systematic laboratory investigations. No matter the content area, regardless of the role inquiry plays in any given learning situation, it should give learners an opportunity to solve real-world problems, overcoming authentic obstacles in solving these problems.

On one extreme, this process can be significantly scaffolded, requiring learners to follow a prescribed path toward a preset solution. On the other extreme it can be open-ended to the point of being defined and solved completely within learners' interests and efforts. Between these two extremes exists intermediate levels of inquiry. Teachers and curriculum developers have a tendency to project more inquiry into their instructional activities than is warranted. Accurately determining the level of inquiry reflected in a particular activity is, therefore, a critical first step to inquiry instruction. Although not currently in widespread use, Herron (1971) developed a simple and practical rubric for assessing the degree to which activities promote student inquiry. Based partly upon the writings of Schwab (1964), Herron's Scale describes four levels of inquiry, each differentiated by the information and support given to students prior to or as they complete the activity.

<u>Four Levels of Inquiry (Herron, 1971)</u>

0. **Confirmation/Verification** – students confirm a principle through a prescribed activity when the <u>results are known in advance</u>.
1. **Structured Inquiry** – students investigate a teacher-presented question through a <u>prescribed procedure</u>.
2. **Guided Inquiry** – students investigate a teacher-presented question using <u>student designed/selected procedures</u>.
3. **Open Inquiry** – students investigate topic-related questions that are <u>student formulated</u> through <u>student designed/selected procedures</u>.

When an activity is evaluated for its level of inquiry, a simple table establishing what is given to the learner determines at which level of inquiry the given activity resides—the less given to the learner the higher the level of inquiry (see Table 1).

Level	Problem?	Procedure?	Solution?
0	✓	✓	✓
1	✓	✓	–
2	✓	–	–
3	–	–	–

Table 1: What is given to the learner?

Early Internet Inquiry: The WebQuest

While WebQuests are touted as being "inquiry-oriented" activities, just where in Herron's inquiry hierarchy do they fall? Originally WebQuests were intended to be structured inquiry (Level 1), as students are given a task (problem) and a process (procedure) to complete the task. Of the WebQuests produced to date, many do not qualify as "inquiry-oriented." In fact, a portion of what creators are labeling as "WebQuests" can easily be confused with less sophisticated, non inquiry-oriented Internet Scavenger Hunts. These "non-inquiry" WebQuests typically require learners to answer given questions, usually listed on a worksheet, and going to specific web sites to answer these questions.

The San Diego State University WebQuest Page includes a database of links to hundreds of created WebQuests. The WebQuests listed in this database were pre-screened for quality but were not investigated as to which level of inquiry each resides. Recently, 75 sampled WebQuests were investigated, 25 from each major schooling level. From this sample, zero WebQuests were Level 3, 12 were Level 2, 45 were Level 1, and 3 were Level 0. Additionally, 15 did not qualify as being inquiry-oriented, but instead qualified as Internet Scavenger Hunts. Unfortunately the widespread acceptance of WebQuests as a valuable educational tool has, in some cases, compromised their original purpose.

Level of Inquiry	Elementary (K-5) n=25	Middle (6-9) n=25	Secondary (9-12) n=25
Not Inquiry	6	3	6
0	1	1	1
1	16	15	14
2	2	6	4
3	0	0	0

Table 2: WebQuest levels of inquiry

WebQuests were developed as an early step in answering the question, "How can Internet resources be effectively used in the classroom?" When the WebQuests concept was created over six years ago, there was no formal method of using the Internet to support "learners' thinking levels of analysis, synthesis and evaluation"—important components of inquiry-based learning. WebQuests can, if created and used correctly, promote inquiry-oriented learning, particularly structured inquiry (Level 1). WebQuests will continue to serve as an important component of web learning, but it is now time to take the training wheels off and consider where the WebQuest concept can lead, especially with regard to promoting higher levels of inquiry-oriented learning.

Guided inquiry (Level 2) requires learners to design and select procedures, and open inquiry (Level 3) also requires that learners formulate their own topic-related inquiries. With no preset procedures and perhaps no teacher-defined questions to drive an activity, is it possible to develop a model similar to WebQuests that is more open-ended?

Some Early Thoughts on Web Inquiry Projects (WIPs)

Web Inquiry Projects (WIPs) are intended to meet this need. Promoting higher levels of inquiry in the classroom requires that less specific guidance be given to students. This fact alone makes it difficult to produce a model that is used by students in the way that WebQuests are used. Therefore, WIPs will be used primarily as a teacher resource, providing loose structure and guidance to teachers wishing to make good use of the wealth of available uninterpreted online data. Such data can be found at thousands of web sites, an excellent source being Digital Resource Centers (Center for Technology and Teacher Education, 2001). Digital Resource Centers "have the potential of transforming university teaching and learning" and "are relevant for K-12 education." Such collections include the Library of Congress' American Memories, the Virginia Center for Digital History's Valley of the Shadow, the National Climatic Data Center, and the U.S. Census. Social studies teachers might use a WIP to help teenage students use primary source materials to determine what life was like for a southern family during the Civil War (Mason & Carter, 1999). A science teacher might use a WIP to help students use historical rainfall data to determine whether or not El Niño had an affect on their local weather during the winter of 1997-98 (Bell, Niess, & Bell, 2001). WIPs created from these examples are available at http://edweb.sdsu.edu/wip.

WIPs are intended to be used as inquiry roadmaps for teachers desiring to promote higher levels of student-centered inquiry, specifically by leveraging uninterpreted online data to answer inquiry-oriented questions. Unlike WebQuests, which provide students with a procedure and the online resources needed to complete a predefined task, WIPs will place more emphasis in having students determine their own task, define their own procedures, and play a role in finding the needed online resources. The WIP concept is based upon and designed to support a spiral path of inquiry (adapted from The Inquiry Page, 2001). WIPs will provide teachers with six stages of scaffolding as they lead students in a web-enhanced inquiry project. While an inquiry-oriented activity might start at any of these stages, WIPs will be designed to initiate student inquiry at the Reflect stage.

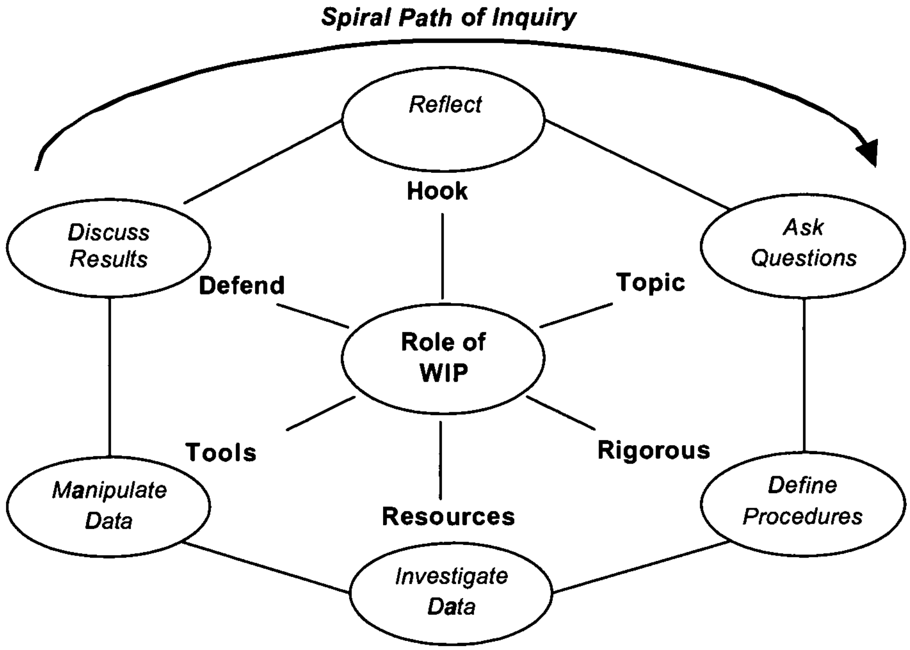


Figure 1: Teacher support of spiral path of inquiry

The six stages in this path, including the proposed role of WIPs in these stages, are as follows:

Stage 1
General description of stage: Teachers leverage previous activities or start anew by sparking students' interest in a topical area. At this stage teachers are to provide a hook, causing students to reflect upon the topic.
Student Role: Reflect on previous or new material.
Teacher Role: Provide a learning hook.
WIP Role: Provide ideas and resources for topical hook.

Stage 2
General description of stage: Based in the students' interests sparked by the hook, the teacher leads students to ask questions related to the topic.
Student Role: Ask questions related to topic.
Teacher Role: Keep questions on topic.
WIP Role: Provide potential topical inquiry-oriented questions.

Stage 3
General description of stage: After questions have been asked by the students, the teacher assists them in defining the procedures for investigation. Here the teacher's role is to ensure that the procedures are rigorous enough, according to the rules defined by each content area, to provide adequate evidence to support potential answers.
Student Role: Define procedures.
Teacher Role: Ensure procedures are rigorous.
WIP Role: Define potential procedures, including type(s) of data needed.

Stage 4
General description of stage: Students seek online data that will be used to answer their questions. At this stage the teacher must provide guidance on the relevancy and reliability of data. Here also, the teacher might participate with students in finding resources or have pre-selected resources in mind in the event that resources are difficult to find.

Student Role: Investigate data.
Teacher Role: Assist students in finding and assessing credibility of data.
WIP Role: Provide list of potential resources of online data.

Stage 5

General description of stage: When data is found the teacher must ensure that students have facility with the tools needed to manipulate data. If numerical data must be manipulated then students will likely need facility with a spreadsheet application. If data is non-numerical, then concept mapping or database software might be required.
Student Role: Manipulate data.
Teacher Role: Teacher provides data manipulation tools and training using tools.
WIP Role: Provide an example of manipulated data.

Stage 6

General description of stage: No conclusion is meaningful unless communicated appropriately. After students have manipulated the data, they discuss and defend their results with each other and the teacher. Here the teacher must support students' efforts in presenting their results in writing, through graphical presentations, and through rhetoric. At this point, new inquiry-based questions might be asked as students reflect upon their results, restarting the process.
Student Role: Discuss and defend results.
Teacher Role: Teacher supports students' efforts in presenting and defending results.
WIP Role: Provide example of defended results. Provide example of new inquiry-oriented questions.

Conclusion

In the last five years WebQuests have proven to be useful in promoting Herron's Level 1 of structured inquiry. At a time when educators struggled to provide an effective way to make good use of the Internet, the WebQuest model supplied the scaffolding needed by both students and teachers. WebQuests will continue to be an important component of inquiry-oriented learning.

Being heavily scaffolded, WebQuests prevent learners from participating in higher-level inquiry activities. Now that both teachers and students have more facility with the Internet, scaffolding from the WebQuest model can be removed, leading us to Web Inquiry Projects. If used appropriately, WIPs will help educators promote guided and open inquiry, Levels 2 and 3, respectively.

References

Bell, R. L., Niess, M. L., & Bell, L. L. (2001). El Niño did it: Using technology to assess and predict climate trends. *Learning and Leading with Technology, 29*(4). 18-23, 26.

Dodge, B. (1995.) Some thoughts about webquests [Online]. Available: http://edweb.sdsu.edu/courses/edtec596/about_webquests.html.

Herron, M.D. (1971). The nature of scientific enquiry. *School Review, 79*(2), 171- 212.

The Inquiry Page. (2001). Available: http://inquiry.uiuc.edu/.

Library of Congress: American memories [Online]. Available: (http://memory.loc.gov).

Mason, C. L., & Carter, A. (1999, September/October). The Garbers: Using digital history to recreate a 19th-century family. *Social Studies and the Young Learner*, 11-14.

National Climatic Data Center [Online]. Available: (http://lwf.ncdc.noaa.gov/oa/ncdc.html).

Schwab, J. J. (1964). Structure of the disciplines: Meanings and significances. In G. W. Ford & L. Pugno (Eds.), *The structure of knowledge and the curriculum* (pp. 6-30). Chicago: Rand McNally.

U.S. Census. [Online]. Available: (http://www.census.gov).

Virginia Center for Digital History: Valley of the shadow. (http://jefferson. village.virginia.edu/vshadow2).

The WebQuest Page. Available http://edweb.sdsu.edu/webquest/overview.htm.

Curriculum, Competence, and Confidence: A *3C* Approach to Teacher Preparation for Technology-integrated Practice

Michael Nord
Willamette University Department of Music
mnord@willamette.edu

Abstract: Effective teacher preparation addresses issues of curriculum, competence, and confidence. Interactive in technology-integrated classroom practice, these "3C"s should be actively intertwined and accounted for in teacher preparation pedagogy. This paper outlines a 3C approach used in both graduate level music teacher preparation classes and in-service workshops. The approach is rooted in the notion that good teaching, not simply good machines, makes for meaningful technology integration.

Overview

Schools are embracing the integration of technology. Teachers and students have the potential to engage in meaningful activities previously unavailable. Music technology, for example, offers practical classroom access to authentic materials and processes that had previously been limited to those with highly specialized skill sets and instrumental resources. Regrettably, schools are not yet enjoying the full potential of technology. This is, I believe, particularly true with regard to music. Impediments to the effective integration of technology into classrooms may be structural or pedagogical in nature.

Structural impediments to the integration of technology include a lack of current hardware and software, lack of appropriate space, limitted access to computer labs, administrative disinterest, and insufficient technology support (Hasselbring et al, 2000; Young et al, 2000; Drost and Abbot, 2000). Pedagogical impediments center on lack of the teacher preparedness to confront the new paradigm of technology-integrated practice (Dunnigan, 1993; Dudt, Yost, & Brzycki, 2000; Whetstone and Carr-Chellman, 2000; Uszler, 1996). The overlap of these structural and pedagogical impediments manifests itself in the lack of opportunity for preservice teachers to observe the kind of *in situ* modeling that will inevitably affect their future practice (Moursund and Bielefeldt, 1999, Carlson and Gooden, 1999).

Those of us who are teachers of teachers have limited opportunity to directly confront the structural impediments that exist in various locales. However, we should strive to *prepare* teachers for the highest levels of technology integration because of the value it brings to schools.

Effective teacher preparation addresses issues of curriculum, competence, and confidence. Interactive in classroom practice, these "3C"s should be actively intertwined and accounted for in teacher preparation pedagogy. As with strands in a rope, a fray in one leaves the others vulnerable. Tripartite models have been described in relation to both the teaching of elementary classroom teachers to teach music (Jeanneret, 1997) and to teach with technology (Merideth & Steinbronn, 2000). This paper will outline a 3C approach as it has been used in both graduate level music teacher preparation classes and in-service workshops. The model is rooted in the notion that good teaching, not simply good machines, makes for meaningful technology integration.

The 3C's

"Curriculum", as used in this discussion, encompasses content and pedagogy. Technology offers new opportunity with regard to both of these curricular dimensions. There is a ring of truth to the old aphorism: "We teach like we were taught." In other words, *all* of our behavior as teachers is modeling. Therefore, teacher education should model practice consistent with that which the teacher educator wants her students to bring to their classrooms (Jeanneret, 1997; Dudt, Yost, & Brzycki, 2000). That practice should account for technology potential in the crafting of a new curricular paradigm, rather than simply plugging the computer into an old one. Teachers, not technology, must craft the new paradigm (Riel et al, 2000).

Technology-integrated teaching requires that teachers develop their own strength in technology use (Pan, 1999; Uszler, 1996)). "Competence," as used in the 3C model, refers to a teacher's practical ability to use and troubleshoot both hardware and software. In many, if not most, schools technical assistance is not readily available. Staff responsible for technology maintenance and training is typically spread thin. Children in classrooms with teachers who are self-reliant are more likely to have consistent access to current *working* technology. Developing competence must also include developing the tools for managing classroom technology use (Duran, 2000).

"Confidence" refers to teachers' *sense* of personal ability and preparedness to the use of technology. Teachers who do not themselves feel comfortable or capable with computing are unlikely to integrate it in any significant way. Whetstone and Carr-Chellman (2000) note that preservice teachers did not see the importance in their own roles in classroom implementation. Significant gender differences exist with regard to self-confidence with technology (Bauer, 2000; Weinman & Haag, 1999).

Curriculum

We want our education students to enter the profession with an inclination to take a step back and ask: "What aims and goals do I have for my students, and how might technology contribute to them." Naturally, as their models, we must do the same, pointedly making content, pedagogy, and the thinking behind our choices explicit. The model we provide will serve our students as a point of departure in their own practice.

Modeling is the single most potent communicator of pedagogy. We teach them "method" by doing with them something analogous to what they will do with their students. In a sense we are trying to nurture their perceptions to both sides of the teacher/student experience, first by putting them in the "role" of their future students, and secondly by later giving them opportunity to put each other in that role. Organized reflection is the glue that binds the pieces. The operative concept is to *do what you would have them do in their future classroom,* rather than describe what you would have them do.

For a music curriculum, Wiggins (2001) advocates the goals of musical literacy, proficiency, and independence. Like other constructivists she suggests that students achieve these goals through problem-centered interactions with authentic materials (Brooks & Brooks, 1993) or situated learning (Duffy& Jonassen, 1992). Specific topics return at ever increasing levels of complexity and interaction (Bruner, 1960; Thomas, 1971). With these perspectives as a philosophical base, the 3C approach focuses on using technology to provide unique opportunities for exploration and problem solving *in* the materials of music. In other words, music technology is most potent when used as a "tool" (as opposed to as a "tutor") allowing students to engage and manipulate the basic building blocks (see Thomas, 1971) of musical works; pitch, timbre, rhythm, form, and dynamics. Classroom teachers craft the focus, sequence, and design of problems. Figure 1 below illustrates some general examples.

complexity/sequence

low/less experience *higher/more experience*

FOCUS	form	pitch	timbre	integrated
SOFTWARE/ HARDWARE	Rap, Rock'n Roll headphones, speakers	Songworks, QT musical instruments	Micrologic AV/ MIDI kybd. System	Micrologic AV/ MIDI kybd. System
PROBLEM	Using an RRR style of your choice, create an ABA form arrangement where the A and B sections are contrasting musically and unequal in length.	Using the supplied chord progression, create a melody using only chord tones	Re-orchestrate your file of Ravel's Bolero, using the General MIDI soundset. Create 2 contrasting versions.	Create a rounded-binary form sequence using separate tracks and timbres for each of two independent voices.

Figure 1 : Curriculum content progression.

Successful integration of technology requires that teachers take students beyond the immediate cognitive and musical products of their interaction with that technology. The lesson, from the perspective of our students being in the role of their own future students, is not over when the machines are turned off. Organized examination of their products (technological or otherwise) is a central element of constructivist practice. Finally, they need to be guided through a reflective review as what happened in their role as "students" and its implications for their future practice.

Competence

In order to successfully integrate technology into their practice, teachers need to know how to use and choose hardware and software. They also must have a repertoire of trouble shooting skills. They must have technique in technology classroom management. In the 3C approach these issues are addressed in lessons and "in process." A good rule of thumb is to take nothing for granted.

With regard to hardware lessons, a number of my own students reported that actually assembling a system in class was invaluable to them, even if they had done it at home. MIDI based music systems are especially complex with their extra hardware and software. A thorough review (and consistent use) of terminology is valuable. My experience suggests doing all of this at the beginning of a semester.

With regard to software lessons, going through installation routines is also valuable. Again, MIDI systems have extra layers of complexity.

Situated learning is the key. Students develop competence by using, and often struggling, with software and hardware. Our goals should center on our students gaining independence. While we are modeling a constructivist curriculum approach that they might use with their future students, they are similarly engaged on another level aimed at *their own* technology skill development.

Some ideas follow:

• Start with unstructured time to "play."

• Don't hand out step by step guides. This teaches them to type, not develop independence.

• Demonstrate a technique or tool and then present them with a problem to solve.

• Be a guide and scaffold, but let them work through their own difficulties.

It is here where the "in process" dimension is at the forefront. For example, after "play" (read exploration) have them demonstrate their discoveries. Everyone discovers something, and the pool of discovery is usually greater than any one individual or team comes up with. Treat "I don't know how I got here" as an invitation for the class to figure it out together. Have individuals or teams present their solution process as well as products. Create an atmosphere where students are comfortable questioning and answering each other. Students should be constantly teaching their peers. The inevitable freezes, glitches, and miscues of technology should be viewed as opportunities for the development of troubleshooting skills. Guide students, but do not solve technology problems for them. Where a student is unable to navigate a particular issue, or that issue is one that you want the entire class to have experience confronting, bring them into the search for a fix. Bear in mind that the goal is to teach them strategies for independent trouble shooting, rather than simply providing a top 10 list of problems and solutions.

We want our students to be independent in their ability to choose software. Once more we need to equip them with a strategy rather than a list. In focused lessons, students must be familiarized with the notions of usability, acceptability, and efficacy. Teams of students can be provided with a question guide that they use to evaluate specific software. Both general and contextual perspectives should be taken. Students can also be asked to formulate and share their thinking behind new questions addressing usability, acceptability, and efficacy. In process, planned and spontaneous examination of the three categories should take place in the context of the activity students are engaged in at that moment.

A final area of competence described above is management. Obviously there is a great difference between the university lab and the elementary school music room. Absent the opportunity for *in situ* modeling/observation opportunities, our students will rely on the modeling we provide in our classrooms, and the anecdotes we can share from our experience. Familiarizing them with the use of management software will be useful. Opportunities for students to take the role of teacher in your classroom, followed by group and individual reflection may be your single most potent means of nurturing their development of management skills.

Confidence

Technology confidence must be actively nurtured in the teacher education classroom, intertwined with the curriculum and competence issues. Confidence is an empowering sense of personal ability in negotiating curriculum and competence issues. While it is a natural by-product of the independence described earlier, we must be active in assuring that it is there. The 3C approach takes the view that one doesn't teach confidence, one teaches *for confidence*. Students must first internalize the notion that it is not the machines that teach, it is they who are teaching with the machine as their tool. In other words, it is they who are in control of the situation. Situations get out of control because of inadequate lesson planning and implementation, and/or technical difficulties.

Lesson planning and implementation is addressed by the models you provide (see Jeaneret, 1997) and the process of reflection that accompanies each experience. Model use of, and create formal reflection time for the "try it yourself first" strategies. We should exemplify the habit of first ourselves trying the creative problems we will assign students. This will not only prepare us to more effectively guide their trouble shooting and negotiate unexpected outcomes, it will provide opportunity to share your own work in the planning, implementing, assessing. Sharing your experience, and especially its hang-ups, will help them change the "it's me" stance to an "it's the nature of the beast and I know how to work with it" stance.

Computers crash and behave erratically just as chalk breaks and nails scratch the board. Confidence with regard to technical issues is addressed by students developing personal learning and troubleshooting strategies through guided confrontation of technical problems in their own and classmates' work. The teacher educator must assure that *all* students learn to solve their technical problems, and assist others. This requires a commitment and patience on the part teacher and class. Be particularly vigilant with female and older students. Taking care of problems *for* your students may allow them, and probably you, more comfort, but it diminishes their independence and thus confidence. Nonetheless, as always, balance and sensitivity should guide decision-making.

Confidence in confronting lesson planning and implementation, and/or technical difficulties is synthesized by our students through their actively assuming the role of teacher to their peers, and multi-leveled roles as students. All students must experience all roles. As their teachers, we must be vigorous in our sensitivity to their concerns and devise focused strategies that give them practical experience in confronting those concerns. Let no one passively (or as Holt might suggest, actively) slip by.

Promoting a realistic multi-dimensional sense of confidence in our students will contribute to a school classroom atmosphere where children are freed to explore with technology, guided by teachers unintimidated by the unpredictable.

The 3C Approach

Teachers of technology-integrated education courses should consider curriculum, confidence, and confidence when developing their syllabi. This applies to planning for both individual lessons and for their sequence. While lessons may emphasize one strand, we teachers of teachers should always account for each of the 3C's and aim for their seamless integration.

Conclusion

A discussion of technology and teaching must reflect the notion that it is not merely the presence of technology, but rather it is the means by which it is engaged wherein lies the potential for improvement in learning. The 3C model seeks to operationalize the view that effective teaching is more likely to occur when teachers have been nurtured in their own capabilities, the sense of their own capabilities, and the processes and products of meaningful lesson building.

The ideas in this paper represent a synthesis of theory and practice as explored by my own teaching in graduate and professional development classrooms. The approach will be applied in undergraduate classrooms next year. While some former students report that they have successfully integrated technology into their own classrooms, formal study remains to be done. Research should look at the integration of technology, efficacy of that integration with regard to the achievement of teaching aims and goals, and the manner in which the 3C teaching approach affected those issues.

References

Bauer, J.F. (2000). A Technology Gender Divide: Perceived Skill and frustration levels among Female Preservice teachers. Paper presented at the Annual meeting of the Mid-South Educational research Association. Bowling Green, KY. (ERIC Document Reproduction Service ED 447 137)

Brooks, J.G. & Brooks, N.G.. (1993) *In search of understanding: The case for constructivist classrooms.* Alexandria, VA: Association for Supervision and Curriculum Development.

Bruner, J. (1960). *The process of education.* Caimbridge, MA: Harvard University Press

Carlson, R.D.: Gooden, J.S. (1999). Mentoring Pre-Service Teachers for Technology Skills Acquisition. *SITE 1999.* Society for Information Technology & Teacher Education International Conference San Antonio TX. (ERIC Document Reproduction Service ED 432 280)

Drost, C; Abbott,J. (2000). Programs that Prepare Teachers to Integrate Technology into Instruction in Meaningful Ways: How Successful Are They?. *SITE 2000.* Society for Information Technology & Teacher Education International Conference: San Diego. (ERIC Document Reproduction Service ED 444 543)

Dunnigan, P, (1993). The computer in instrumental music. *Music Educators Journal*, 80 (1), p32-39. (Electronic Document, Academic Search Elite)

Dudt, K.; Yost, N.; Brzycki, D. (2000) Preparing Teachers for the Digital Age: Implementing a Dynamic Model of Pedagogical Change *SITE 2000.* Society for Information Technology & Teacher Education International Conference: San Diego. 72-75. (ERIC Document Reproduction Service ED 444 529)

Duffy, T.M. & Jonassen, D.H.(1992). Constructivism: New implications dor instructional technology. In T.M. Duffy & D.H. Jonassen (Eds.), *Constructivism and the technology of instruction*_(pp. 1-16). Hillsdale, N.J.: Lawrence Erlbaum Associates.

Duran, M. (2000). Preparing Technology Proficient Teachers. *SITE 2000.* Society for Information Technology & Teacher Education International Conference: San Diego. 129-134 (ERIC Document Reproduction Service ED 444 529)

Hasselbring, T., Smith, L, Glaser,C., Barron, L., Risko, V.J., Snyder,C., Rakestraw,J.,& Campbell, M. (2000). Literature Review: Technology to support teacher development. Office of Educational Research and Improvement: Washington DC. (ERIC Document Reproduction Service ED448159

Jeanneret, N.(1997). Model for developing preservice primart teacher's confidence to teach music. *Bulletin of the Council for Research in Music Education* 133 (Summer) 37-44

Meredith, E. M., Steinbronn, P.E. (2000) Preservice teachers as Constructivist Producers and Critical consumers of Technological Resources. *SITE 2000.* Society for Information Technology & Teacher Education International Conference: San Diego. 107-111 (ERIC Document Reproduction Service ED 444 529)

Moursund, D., Bielefeldt, T. (1999). Will New Teachers be Prepared to Teach in a Digital Age: A National Survey on Information Technology in Teacher Education.Santa Monica, CA: Milken Family Foundation. (http://www.mff.org/publications/publications.taf?page=154)

Pan, A.C. (1999). Effictive Approaches to Teach Computer Applications to Teachers. *SITE 1999.* Society for Information Technology & Teacher Education International Conference San Antonio TX. (ERIC Document Reproduction Service ED 432 290)

Riel, M., Schwarz, J., Peterson, H., Henricks, J. (2000). The power of owning technology. *Educational Leadership* 57 (May). 58-60.

Thomas, R (1971). *MMCP synthesis.*_ Bellingham, Wa.: Americole.

Uszler, M (1996). The independent music teacher: practice and preparation. *Arts Education Policy Review*, 97.(3) 1996. 20-29.

Whetstone, L: Carr-Chellman (2001} Preparing preservice teachers to use technology. *Tech Trends* 54 (4) 11-17, 45.

Weinman, J; Haag, P. (1999). Gender Equity in Cyberspace. *Educational Leadership* 56, (February). 44-49.

Wiggins, J. (2001). *Teaching for musical understanding.* Boston: McGraw Hill.

Young, S.; Cantrell, P. P.; Bryant, C. J.; Roberts, C. G.; Paradis, E. E.; Archer, L.H. (2000). The state of technology in university teacher preparation and public schools in Wyoming. *Teaching & Change*, 8 (1). 134-145.

The PDCA Model: A Basic Evaluation Tool

Catherine A. Offutt, Outside Evaluator, University of New Mexico – Gallup, USA, melcat@nm.net

Connie J. Casebolt, Business Dept., University of New Mexico – Gallup, USA, conniejc@unm.edu

Abstract: The PDCA model allows any grant-funded project to make a comprehensive bridge between the project logic model to the daily workflow model of managing for success. The PDCA model offers an organized way to explain the processes through which the project has evolved and points directly to methods, which are either effective or ineffective. The PDCA model of formative evaluation provides Project Managers, Partners, Evaluators, etc. with a document which keeps the information about a given project organized, timely, and comprehensive.

Most grants require both formative and summative evaluations to be performed over the life of the funded project. Most recipients of grant funds struggle with the efficient application of evaluation methodologies, within the scope of the funded project. Few agencies prescribe the specific formats for conducting evaluation. Striking the proper balance between process evaluation and impact/outcome evaluation can be tricky and time consuming. A method, which follows the flow of the project, yet allows for critical evaluation and restructuring of problem areas can be most helpful.

PDCA stands for Plan, Do, Check and Act. The PDCA model allows every project, whether it is a PT3, Technology Challenge or in a totally unrelated area, to make a comprehensive bridge between the project's logic model to the daily workflow model of managing for success.

Collaborative partnerships appreciate this model because it allows each Partner to showcase their contributions while keeping them informed of the activities of other Partners. Further, it provides a basis, when used in conjunction with a project logic model, for optimizing creative solutions to problems as they arise within the project scope.

The PDCA model offers an organized way to explain the processes through which the project has evolved and points directly to methods, which are successful, as well as those which are problematic. The project's federal Program Manager can easily see what has been accomplished and what remains to be completed. Additionally, areas, which are difficult to manage, can be identified and technical help can be applied where necessary. The PDCA model facilitates the creation of interim and annual reports to funding agencies.

The PDCA model should, ideally, be completed at the time of grant application and used to facilitate the funder's review of the grant proposal. However, the PDCA model can also be completed following the grant award. The objectives of the proposal need to be translated from the grant application to the PDCA form and then a step-by-step listing of activities necessary to accomplish each of the objectives are listed and prescribed a responsible party and timeframe for accomplishment. Each item that is developed will be assigned a status, as of a given date, which tells the reviewer which issue the item pertains to and what priority the item has been assigned. Then each item within the PDCA model is periodically (usually quarterly) evaluated, based on reports of activities conducted and logs of dosage data. Once an activity and/or objective is successfully accomplished, the procedure becomes standardized, the success shared with others and the status of "Resolved" is assigned. Should the activity not be accomplished given the initial strategic plan and assignment of resources, the "ACT" column becomes the place where new ideas and revised strategic plans can be documented until success is achieved.

Utilization of the PDCA form of process evaluation helps Project Directors/Managers develop, organize, implement and monitor the multiple objectives of any given project. Used in conjunction with the project's logic model, the PDCA form also facilitates the identification of problem areas, the engineering of a new strategic plan for solving such problems, and highlighting areas where technical assistance from the funding agency may be beneficial.

This model is easy to use and lends itself to capturing the ebbs and flows of project management over time. Mostly, the PDCA model keeps the flow of information about a given project organized, timely and comprehensive.

PT3 Project Performance Improvement Tracking Log as of 10/31/01

MISSION: To support the transformation of teacher preparation programs into 21st century learning environments that prepare technology-proficient educators to meet the needs of 21st century learners.

VISION: To improve the knowledge and ability of future teachers to use technology in improved teaching practices and student learning opportunities, and to improve the quality of teacher preparation programs.

GOAL: To modify and enhance the current early childhood, elementary and secondary teacher preparation programs offered through the University of New Mexico – Gallup Campus.

ISSUE RELATIVE TO WHICH ELEMENTS (Check all applicable):
#1 – UNM-G Faculty Training #2 – UNM-G Pre-Service Teacher Training #3 – Zuni In-service teacher training
#4 – Zuni K-12 student accomplishment #5 – Curriculum Development/Re-development
#6 – Partnership Development #7 - All elements

PRIORITY CODE: **#1 = Most Important** **#2 = Next Most Important** **...** **#N = Least Important**

STATUS CHOICES: R = Resolved U = Unresolved RDP = Resolved to Degree Possible RM = Resolved but Continue to Monitor

GPRA Std. #	Issue #	Priority Code	PLAN Description of issue to be accomplished, as outlined in original grant application.	DO What is the solution or action you are trying? (Responsible Party; Timeframe)	CHECK Evaluation of Action (Site evaluation tool as reference.)	ACT Are you ready to standardize the action you took and train all who are affected?	STATUS CODE
N/A	7	N/A	Secure funding for TTEL initiative.	Dr. Helen Zongolowicz submitted PT3 grant application in April 2001. $181,847 in PT3 funds awarded for performance period beginning 7/1/01.	Final documents received and accounts activated 10/01. Additional $21,000 added 10/01.		**R**
1.4, 2.1, 3.1, 3.3	7	2	Form triads comprised of one college instructor who has responsibility for educating pre-service educators, one classroom teacher who will mentor a pre-service educator, and one pre-service educator.	Project Directors to identify TTEL participants and execute contracts with each to secure grant compliance by 12/15/01.	Review of executed PT3/TTEL contracts.		**U**

0

Critical Thinking and Electronic Discussion

Joanne Y. Pelletier, PhD
School of Education
Acadia University
Canada
joanne.pelletier@acadiau.ca

Margaret Brown, EdD
School of Education
Acadia University
Canada
margaret.brown@acadiau.ca

Gregory R. MacKinnon, PhD
School of Education
Acadia University
Canada
gregory.mackinnon@acadiau.ca

Abstract:. Certain processes of coding electronic discussions have been shown to improve the quality of argumentation styles in online discussions. This paper addresses a) a teacher education course in physical education where cognotes are used to prompt students to consider more substantive electronic discussion interaction b) an inclusive education course "aligned in time-frame" to the physical education course such that the transfer of skills to other courses (without prompting) can be judged.

Introduction

Since its inception, electronic discussion has been used primarily to offer an asynchronous environment for casual exchange of ideas between students. In recent years this has evolved to more thought-provoking exchanges promoted in part by improved professor interaction.

With regard to evaluation, early uses of electronic discussion amounted to participation grades which gave little credence to the quality of the discussion. Efforts to improve the quality of discussion have included the design of analytical rubrics that gauge broad styles of student interaction. For example if a student responded to an instructor's prompt and raised a new question they may be awarded a passing grade for the electronic discussion.

Current Practice

Acadia University created in 1997 an institutional network called Acadia Courseware Management Environment or ACME where students participate in electronic discussion groups (hereafter EDG's) within undergraduate courses. Most recently, MacKinnon & Aylward (2000) have designed a macro-based coding system for electronic discussions called cognotes. These cognotes highlight specific aspects of critical thinking and higher-order argumentation styles. To date, several limited studies have been undertaken namely: (1) teacher-coding of student discussions in a science education class (Aylward & MacKinnon, 1999) and (2) student coding of peers in a middle school education course (MacKinnon & Bellefontaine, 2001). Results from this last study has indicate that cognotes as a teaching strategy has the potential to improve communication patterns within a context where students apply the codes electronically to evaluate their peers.

The purpose of this study was to further examine the link between our electronic EDG's and critical thinking necessary for substantive student discussion. Part A of this study addresses a teacher education course in physical education where the cognotes are used to prompt students to consider more substantive electronic discussion interaction, rather than actually applying the codes electronically. Does the introduction of cognotes as a teaching strategy prompt students to improve their electronic discussion communication patterns? Part B of this study addresses an inclusive education course "aligned in time-frame" to the physical education course such that the transfer of skills to other courses (without prompting) can be judged. Do students who have been introduced to the strategy improve their electronic discussion group communication patterns in others courses? Are these communication patterns more substantive than those from students who have not been introduced to the cognote teaching strategy?

Part A: Electronic Discussion Group Setting With the Introduction of Cognotes

Setting

This study began within a teacher education course in physical education where students were invited to construct new meaning about teaching from engaging in electronic discussions stemming from learning activities experienced in class related to physical education content and teaching strategies. Students, in groups of 4 or 5, initially engaged in an electronic discussion prior to being introduced to the cognotes developed by MacKinnon & Aylward (2000). "Cognotes" are used as student prompts to consider more substantive electronic discussion interaction. Students (a) were introduced to cognotes, (b) distinguished between critical categories and (c) created their own statements for each category in a teacher-led exercise. Students were then invited to assess an earlier EDG using the coding system as a scaffold to determine the nature and level of their entries. The process of self-assessing one's entries was also part of the assessment system at the close of each of topic with the intent to challenge students to ensure that they were engaging in high-level discussions by the end of the semester. Data was gathered from all 52 students in the Bachelor of Education Elementary Program (B.Ed.) enrolled in this Physical Education in Inclusive Elementary Schools methods course. Data consisted of all EDG entries captured from the first and last electronic discussion prompt introduced in class during the fall semester.

Analysis

An inductive analysis of student entries was conducted based on the coding system developed by MacKinnon & Aylward (2000). This analysis indicated that a significant number of students offered their unsubstantiated opinion as opposed to engaging in more substantial argumentation patterns such as cause & effect, compare/contrast, idea to example/example to idea etc.

"Phys Ed teacher should teach overall fitness awareness, basic skills that will help students be active, and develop a positive attitude towards a physically active life (opinion). In teaching Phys Ed. An instructor needs to be able to match the skills and activities to the lesson to the physical capabilities of the students (opinion). Activities should be fun with the focus on students learning skills rather that on performance (opinion)."

Students also sent messages agreeing with others people's messages and essentially only repeating what someone else said.

"Sandra ... I thought your point about teaching physical education as a life style not a subject was excellent especially in light of the fact Canadian Children are becoming increasingly inactive" (agreement).

Meanwhile there were instances where students did support and extend their ideas. "Learning, whether it takes place in the classroom or in the gym is more effective when it is fun (opinion). When learning is fun students will be more engaged and are therefore likely to retain what was taught (building a point). Thinking back on early school experiences, I remember even now the good, fun learning times such as the puppet play we put on to retell a story. I don't recall as much on what was taught to me in the lecture format except that it was boring and I spent more time watching the school clock waiting for the bell than that doing any real learning. I don't' think its is a question of whether we should develop skills or have fun. A better question would be, how do we as educators incorporate fun into our lessons so that more learning can be accomplished"

On a few occasions it was clear that students were not only providing support for their way of thinking, they were furthering the discussion by building on points that other students had previously made.

" Dan made a great point. P.E. and fun should go together (agreement). If the activities are fun, the children will enjoy learning the skills and develop a better outlook on skill development and active living (building a point). For me, gym was always fun. Some drills may have been more tedious, but if they were made fun with a competitive edge. Students would enjoy and look forward the classes" (idea to example).

Table 1 shows the distribution of discussion patterns in the electronic discussion for the Physical Education Methods course.

Students	Proving opinion or agreement			Providing support for one's thinking			Building on other's thinking		
	?	=	?	?	=	?	?	=	?
Physical Education only (N= 52)	10	5	37	37	5	10	33	9	10

Table 1: Distribution of elementary program students according to their discussion group patterns within the Physical Education Methods course.

By comparison to earlier work done by Aylward & MacKinnon (1999) these results are not surprising. In the aforementioned research above, students were not evaluated on the quality of their participation. They were encouraged to participate in EDG's in more substantive ways however, their response to this was not reflected in a grade. This is in contrast to the work of Aylward & MacKinnon (1999) where in fact students were graded based on a hierarchal "cognote" grading scheme. The Physical Education course data then corroborates the dilemma that MacKinnon (2000) posits, i.e. grading the discussion may provide incentive to improve argumentation styles but is the impact long-term? This then leads to the question of whether improved discussion patterns transfer to other courses. This then constitutes the second component of this paper.

Part B: Electronic Discussion Group Setting Without the Introduction of the Cognotes

Purpose

Part B of the study of electronic discussion groups (EDGs): 1) searched for evidence of transfer of discussion skills from one course to another without prompting students using coding categories (Group A), 2) examined inherent skills in a control group that had no prior instruction (Group B), and 3) examined skill growth over time in both groups.

Study Groups

Group A were B.Ed. Elementary Program students (n = 16) concurrently enrolled in the Physical Education in Inclusive Elementary Schools methods course and in the Issues in Inclusive Schools foundation course. Group B were B.Ed. Secondary Program students (n = 43) enrolled in the Issues foundation course but not in the PE methods course.

Both courses used EDGs and as noted, Group A students were introduced to cognotes and their particular use in stimulating higher levels of critical thinking in the PE course. However, no such instruction was given to either Group A or B in the Issues course beyond the mechanics of using EDGs and the value of critical thinking in their work. All entries from the first and last topics assigned in the electronic discussions comprised the data for this analysis.

Analysis

Using the coding system developed by MacKinnon and Aylward (2000), the analysis grouped students' EDG entries according to the following response types. P1 indicated off-topic or faulty logic; P2 indicated agreement with others, expression of opinion, asking a question, simple compare/contrast with no significant new information; P3 indicated clarification with new information, building on a point, making inferences, describing cause/effect consequences, ideas illustrated by examples, and examples leading to new ideas, that is essentially carrying the conversation forward to a higher cognitive level. The growth in discussion skills (as defined here) over the duration of two electronic discussions is noted in Table 2.

	Group A (Elem: n = 16)			Group B (Sec: n = 43)		
	Topic 1	Topic 2		Topic 1	Topic 2	
P1	2.8%	4.4%	(+ 1.6%)	3.3%	4.9%	(+ 1.6%)
P2	56.0%	48.2%	(- 7.8%)	69.4%	50.3%	(- 19.1%)
P3	41.2%	47.7%	(+ 3.5%)	27.3%	44.8%	(+ 17.5%)

Table 2: Skill Growth: Topic 1 Discussion to Topic 2 Discussion

Skill growth in both A and B Groups was shown by increases in (P3) higher level responses, decreases in (P2) lower level responses, and countered by slight increases in off-topic (P1) responses. However, Group A consistently had a higher percentage of P3 responses and a lower percentage of P1 responses than Group B, indicating a greater initial skill level in Group A as well as continued skill growth.

From Table 3, over time, response frequency for Group A showed a slight increase, while a definite decline was noted for Group B.

	Group A (Elem: n = 16)			Group B (Seco: n = 43)		
	Topic 1	Topic 2		Topic 1	Topic 2	
Mean	13.6	14.3	(+0.7)	16.9	13.9	(-3.0)

Table 3: Response Frequency: Topic 1 to Topic 2

Discussion

It appears as though some students are retaining the electronic discussion skills gained from one course and applying them in another. Despite being prompted with the variety of patterns they might access, many students are choosing not to seriously improve their electronic discussion. From earlier work (MacKinnon, 2000) it seems quite evident that scoring the EDG quality could significantly enhance the number of students that consciously improve their argumentation patterns.

References

Aylward, L. & MacKinnon, G. R., (1999). Exploring the Use of Electronic Discussion Group Coding with Pre-service Secondary Teachers, *Journal of Information Technology for Teacher Education*, 8(3), 335-348.

MacKinnon, G. R. & Aylward, L. (2000). Coding electronic discussion groups. *International Journal of Educational Telecommunications*, 6 (1) 53-61.

MacKinnon, G. R. (2000). The dilemma of evaluating electronic discussion groups, *Journal of Research on Computing in Education* 33 (2), 125-131.

MacKinnon, G. & Bellefontaine, J. (2001). *Middle school education and CD ROM technology*. Society for Information Technology & Teacher Education, Published Proceedings 1444-1449.

Acknowledgements

This work was supported by several Innovative Teaching Grants (Acadia University) as well technical assistance from the Acadia Institute for Teaching and Technology. The opportunity to present this work has been afforded by Acadia University/AITT.

Reality Based Teaching: Sci-Tech Research Projects

A proposal submitted to AACE by
Kecia Ray, Ed. D.
Education Technology Development
Vanderbilt University Medical Center

Scientists at Vanderbilt University Medical Center work in teams each day to conduct valuable medical research. The Sci-Tech Research Project encourages middle or high school students to assume the role of various types of medical research scientists working in research teams at Vanderbilt University Medical Center. Students participate in this classroom project by establishing teams of four and choosing to be Primary Investigator (Ph. D. or M. D.), Lab Director (Master Degree), Lab Technician (Bachelor Degree) or Fellow/Graduate Student (Ph. D. or M. D.) within their team. Only one Ph. D. and one M. D. is on each team. Students must determine which position they want to hold within the team, recognizing the qualifications and responsibilities of each position.

Vanderbilt medical researchers present hypotheses to each team. Students work in teams to test the hypotheses within a designate period. Vanderbilt research scientists will use videoconferencing technology in order to communicate with the Sci-Tech Research Teams answering questions and providing guidance. Each group will use a Compaq IPAQ handheld to record findings and create a presentation based on these findings. The culminating activity includes team members of the Sci-Tech Research Project visiting a science lab in the Vanderbilt University Medical Center, presenting their findings to the researchers who posed the hypotheses and meeting their research scientist counterpart.

Participating in this project incorporates skills related to understanding the scientific method process, utilizing technology to collect and record data, team building, speaking to a group, utilizing technology to present findings, and skills related to the hypotheses, which are curriculum connected. This teaching strategy combines project-based learning, technology and reality-based teaching in an effort to increase student interest not only in science and technology but also in pursuing careers in the health sciences.

Ethics in Technology: Crucial Considerations

Fidel M. Salinas Ed.D.
Denise M. Smith, Ed.D., CCC-SLP

This study posits ethical issues in a technological world and their impact on education, business, industry, and government. Major topics included in this discussion include:

1. Ethics in curriculum development for Face-to-Face or Distance Learning environments on the Internet. Survey of Intellectual Property, explores the following: Who owns what, where, and when, domestically, and on a global basis?

2. Impact of licensing technological applications in a Global economy and on individual and social behaviors beyond software piracy.

3. Technological ethics issues and their impact on education, both, in academic institutions, and the industrial communities.

4. Global perspective of the impact of technology on the emergence of requirements for a new code of ethics on Global free speech, privacy rights, libel, slander, and ***Netiquette*** practices.

Intended audience members for this presentation are educators and administrators pre-K through adult.

A New Dimension of Teaching in Digital Learning Environments - Teaching Teachers to Teach Between Schools

Ken Stevens,
Director, Centre for TeleLearning and Rural Education
Faculty of Education, Memorial University of Newfoundland
St Johns, NF Canada A1C 5S7
stevensk@mun.ca

David Dibbon
Associate, Centre for TeleLearning and Rural Education
Faculty of Education, Memorial University of Newfoundland
St Johns, NF Canada A1C 5S7
ddibbon@mun.ca

Abstract: The integration of information and communication technologies and, in particular, the increasing presence of the Internet in teaching and learning, challenges traditional educational considerations of time, distance and location. It also challenges traditional notions of the school. The ubiquity of information and communication technologies in education systems enables teachers and learners to form new teleteaching and telelearning relationships. The development of Internet-based technologies and the choice these provide of synchronous and asynchronous teaching and learning has encouraged some teachers to reconsider the organization of schools as well as the nature of their classroom work. This paper considers issues in the integration of information and communication technologies in teaching and learning for the organization of schools in the context of a shift from distance education to telelearning. A case study of senior high school students in selected small, rural Canadian communities who have been provided with opportunities to learn university-level Science and Mathematics within virtual classes located within a digital intranet provides the background for this paper.

Introduction

The urbanization of the Canadian landscape along with falling birth and fertility rates have combined to pose a threat to the ability of small rural schools to offer a high quality education program to the school-aged children they serve (Dibbon and Sheppard, 2001). As rural communities and schools decline in size educational policy makers often question their viability and as a result new educational structures suitable for delivering quality education to rural schools are being developed. The introduction of telelearning in schools in Canada, as in other developed countries, has been particularly noticeable in rural areas and has been largely influenced by declining enrolments and limited fiscal resources.

The rapid growth and educational application of the Internet has led to a challenge to traditional ways of teaching and learning at a distance that were based on paper and the postal system. TeleTeaching is Internet-based and does not require the degree of central control that distance educators have traditionally had. Teleteaching at the present time involves a search for appropriate pedagogy to enable teachers and learners to gain maximum advantage from the devolved, flexible and increasingly collaborative ways of organizing learning that are now possible between teachers and learners in multiple networks.

TeleLearning for Rural Canadian Communities

Thirty one percent of schools in the province of Newfoundland and Labrador are designated "small rural schools" (N=122) and 75 of these have fewer than 100 students. Seventy of the small rural schools in this province are classified as "all-grade" (K –12) which means that they must offer a senior high school program that meets the provincial certification standards. The concern expressed by educators in many of these small schools is that they do not have the capacity to provide quality programs in all areas of the school curriculum. Therefore, the large proportion of small schools located in rural communities requires special consideration in the development of new, electronic educational structures. The search for appropriate new educational structures for the delivery of education to students in rural Newfoundland and Labrador has led to the development of Digital Intranets, within which virtual classes have been organized. In the process of developing teleteaching within digital Intranets, several challenges have had to be met.

Preparing Advanced Placement Science and Mathematics for the Internet

The development of Advanced Placement (AP) Web-based courses in Biology, Chemistry, Mathematics and Physics took place within subject area teams. A lead science teacher in each discipline was paired with a recent graduate in each of the disciplines of Biology, Chemistry, Mathematics and Physics who possessed advanced computer skills including web page design, Java and HTML. The lead teacher and the graduate assistant were advised from time to time by Faculty of Education specialists at Memorial University of Newfoundland in each curriculum area and, where possible, scientists from the Faculty of Science. The extent to which each web-based course was developed by a team of four people varied. Most course development took place through interaction between lead teachers and the recent graduates. Although at times professors had different opinions as to the most appropriate approach to the design of the courses, this model enabled the four courses to be developed over a sixteen-week summer recess period in time for the 1998-1999 school year. Minimum specifications were adopted for computer hardware and network connectivity. All schools involved in the project had DirecPC satellite dishes installed to provide a high-speed down-link. In most rural communities in this part of Canada, digital telecommunications infrastructures do not enable schools to have a high-speed up-link to the Internet. Appropriate software had to be identified and evaluated for both the development of the resources and the delivery of instruction within the Intranet. Front Page 98 was selected as the software package. Additional software was used for the development of images, animated gifs and other dimensions of course development. These included Snagit32, Gif Construction Set, Real Video, and similar packages. Many software packages were evaluated and finally WebCT was selected. This package enabled the instructor to track student progress, it contained online testing and evaluation, private Email, a calendar feature, public bulletin board for use by both instructor and student, a link to lessons and chat rooms for communication between teacher and student. For real - time instruction, Meeting Point and Microsoft NetMeeting were selected. This combination of software enabled a teacher to present real-time interactive instruction to multiple sites. An orientation session was provided for students in June 1998, prior to the implementation of this project in September. Students had to learn how to communicate with each other and with their instructor using these new technologies before classes could begin.

The Development of a Digital Intranet

The electronic linking of eight sites within the Vista School district to collaborate in the teaching of AP Biology, Chemistry, Mathematics and Physics created a series of open classes in rural Newfoundland that became known as the Vista School District Digital Intranet. The creation of the Vista School District Digital Intranet was an attempt to use information and communication technologies to provide geographically-isolated students with extended educational and, indirectly, vocational opportunities. This has been part of a broader pan-Canadian initiative to prepare people in Canada for the Information Age (Information Highway Advisory Council, 1995,1997). The development of the Digital Intranet within a single school district involved the introduction of an open teaching and learning structure to a closed one. Accordingly, adjustments had to be made in each participating site so that administratively and academically, AP classes could be taught.

The Vista school district initiative challenged the notion that senior students in small schools have to leave home to complete their education at larger schools in urban areas. By participating in open classes in real (synchronous) time, combined with a measure of independent (asynchronous) learning, senior students were able to interact with one another through audio, video and electronic whiteboards. Because this

Intranet comprised a single school district and because the students lived within 60 miles of each other, from time to time they were transported to a central location where they were able to get acquainted with each other and their tele-teacher. While AP courses are a well-established feature of senior secondary education in the United States and Canada, it is unusual for students to be able to enroll for instruction at this level in small schools in remote communities.

From Closed to Open Teaching and Learning Environments

The major change in instruction for the students in the first Digital Intranet in Newfoundland and Labrador was the provision of learning in a flexible manner, building around the geographical, social and time constraints of individual learners, rather than those of the traditional school. Students from eight different communities had the opportunity to study advanced science subjects and mathematics as members of open classes from their small, remote communities. Instead of meeting in traditional classrooms, the Digital Intranet provided students with simultaneous access to multiple on-line sites, as well as the opportunity to work independently of a teacher for part of the day.

The advent of the Digital Intranet had implications for students who began to interact with teachers and their peers in a variety of new ways. Many students experienced difficulty expressing themselves and, in particular, asking questions in open electronic classes when they did not know their peers from other small communities. The organization of social occasions for students learning science in open classes in the Intranet helped overcome these problems. The need to prepare for classes before going on-line became increasingly apparent to both teachers and students if the open, synchronous, science classes were to succeed. As the commitment to come to class fully prepared increased, students became more comfortable with one another and inhibitions such as asking questions on-line were overcome. Also, as their studies progressed, the students were increasingly subject to scrutiny by their peers as they responded to questions and concerns through chat-rooms, audio, video and with their AP on-line teacher. In future, interaction in the Vista Digital Intranet will be both synchronous and asynchronous.

The need for increased technical support for this new, open structure has become increasingly urgent for teachers and students who are using information and communication technologies to teach and learn across dispersed sites. Both have to be provided with expert advice and instruction in the use of new applications. A particular problem has been the difficulty in securing and maintaining instructional design expertise in the preparation and upgrading of courses delivered through the Intranet. Since these instructional design experts are not available to the school system on a full-time basis tele-teachers need to work closely with instructional designers on a skills transfer program that will enable these tele-teachers to keep their courses up to date and relevant.

Teaching Between Schools (Sites) in Rural Communities

In the process of developing teleteaching and telelearning within Digital Intranets in rural Newfoundland and Labrador, teachers, learners and administrators had to adapt to a new, electronic educational structure in which teaching and learning took place between, as well as in, it's constituent participating sites.

In the open teaching and learning environment of a digital intranet, participating institutions academically and administratively interface for that part of the school day during which classes are being taught. This is a different educational structure from the traditional and, by comparison, closed educational environment of the autonomous school with its own teachers and its own students. There is a potential conflict between a school as an autonomous educational institution serving a designated district and schools which become, in effect, sites within electronic teaching and learning networks. Issues related to governance, teacher allocations, teacher and student scheduling, work load and training and development will need to be resolved before open teaching and learning model can be fully adopted.

Principals and teachers appointed to the closed, autonomous learning environments of traditional schools frequently discovered that the administration of knowledge requires the development of open structures within which they are increasingly expected to collaborate with their peers located on a range of distant sites. Some now find that the positions to which they were appointed in traditional (closed) schools have become, in effect, locations within new (open) electronic schools and some of the teachers actually spit their teaching assignment between the open and closed model of school.

An essential aspect of the development of open electronic classes is the coordination of both hardware and software between schools. Without coordinated technology, schools cannot fully participate in electronic networks. However, the purchase of appropriate hardware and software is a matter of confusion for many principals, teachers and School Boards who seek support and advice. Many rural schools with open electronic classes realized that the successful administration of a network required local technical support. Unless adequate technical support systems can be established, electronic networked classes could be curtailed by teachers who could argue, with justification, that there is insufficient back-up to justify their investment in telelearning.

In small and remote Canadian communities the assurance of adequate technical backup is often particularly difficult to provide for teachers and their senior students. In schools in Newfoundland and Labrador, the majority of which are designated rural, telelearning often depends on the goodwill of one or two teachers with enough technical knowledge to develop and maintain school networks and to troubleshoot when malfunctions occur.

Pedagogy for TeleLearning

Although it has yet to be shown that open Internet-based classrooms suit the needs of all students, particularly those at junior levels, they do provide rural schools with choice in the way they can access educational and, in particular, curriculum opportunities. Teaching in classrooms that are electronically linked to other sites requires different lesson preparation and delivery skills from teaching face to face. For teacher – student interaction in a new electronic structure to be effective, the strengths and weaknesses of the new environment have to be understood by everyone who participates.

Students often have more independence in managing their learning in open electronic classes but most have to be assisted by teachers in the setting of goals, the meeting of deadlines and in evaluating their progress. Teachers are effective in open electronic classes if they can be flexible in ways they enable students to participate in on-line lessons. Audio-graphic networking has in the recent past provided schools participating in regional electronic networks with a simple and flexible way of accommodating the diverse needs of learners (Stevens, 1994). The student's need to concentrate on the audio lesson to fully participate in it when conducted in an open electronic class between several sites was noted by several participating schools in earlier research in New Zealand (Stevens, 1994). Students cannot anticipate when they will be asked a question over the audio network, something that encourages preparation for classes conducted with teachers and peers who are not physically present (Stevens, 1998; 1999).

The nature of Tele-learning requires dedication and discipline on the part of learners and they must be motivated to complete and participate in all aspects of the learning program. As a result, high quality interaction with learning materials and interaction between teachers and other learners is essential for effective learning. With the right support, tele-learning has the potential to open new and exciting worlds to more and more students, at all levels.

Strategies and protocols for on-line teaching have to be developed between participating schools if all students are to be able to fully participate. The introduction of a rural school to an open electronic network considerably improves its resource base for both teachers and learners but does not solve all of its problems. It is often difficult to coordinate the timetables of networked schools and a considerable measure of inter-institutional and intra-institutional cooperation is required to develop detailed and effective plans for collaboration.

There are several immediate pedagogical challenges to be considered for effective teaching in a Digital Intranet: Teaching face-to-face and on-line are different skills and teachers have to learn to teach from one site to another. This is fundamental to the success of teleteaching. Teachers have to learn to teach collaboratively with colleagues from multiple sites and educators have to judge when it is appropriate to teach on-line and when it is appropriate to teach students in traditional face-to-face ways. These judgements have to be defended on the basis of sound pedagogy.

Conclusion

The introduction of inter-school electronic networks has added a new dimension to education in Canada and is bringing new challenges for teachers and learners (Collis, 1996; Hobbs and Christianson, 1997) and administrators. The teachers and researchers who are collaborating in the development of new electronic structures for delivering education to dispersed, rural sites in Atlantic Canada are very conscious of being pioneers.

In rural Newfoundland and Labrador the open learning model challenges the closed model of schooling by questioning the need for appointing all teachers to schools, rather than, in appropriate cases, some teachers being appointed to networks of schools. It questions the appropriateness of learners engaging solely with their peers within their own, physical classrooms, and, it questions the very notion of the school.

Technically, tele-learning is defined as the asynchronous or synchronous (real-time) delivery of training and education over the Internet to an end-user's computer or Internet appliance. Philosophically, tele-learning signals a shift of epic proportion in the way we will approach learning in the future. If we are prepared for the opportunities this type of learning presents we will be better prepared to meet the needs of all our students. If not, we may miss or delay the greatest potential changes in learning and the subsequent empowerment of people that the world has ever witnessed.

References

Collis, B. 1996. Telelearning in a Digital World - The Future of Distance Learning, London and Boston, Thompson Computer Press

Dibbon, D. and Sheppard, B. 2001. *Teacher Demand, Supply and Retention in Newfoundland and Labrador.* Memorial University of Newfoundland. St. John's.

Hobbs, V. M and J.S. Christianson. 1997. *Virtual Classrooms*, Basel, Switzerland & Lancaster, Pennsylvannia, Technomic Publishing

Information Highway Advisory Council. 1995. *The Challenge of the Information Highway*, Ottawa, Industry Canada

Information Highway Advisory Council. 1997. *Preparing Canada for a Digital World*, Ottawa, Industry Canada

Stevens, K.J. 1994. Some Applications of Distance Education Technologies and Pedagogies in Rural Schools in New Zealand, *Distance Education* 15 (4)

Stevens, K.J. 1998. The Management of Intranets: Some Pedagogical Issues in the Development of Telelearning, In: A. Higgins (ed) *Best Practice, Research and Diversity in Open and Distance Learning*, Distance Education Association of New Zealand, Rotorua, New Zealand, pp: 279 – 286.

Stevens, K. J. 1999.Telecommunications Technologies, Telelearning and the Development of Virtual Classes for Rural New Zealanders *Open Praxis* (1).

Rubrics for Online Learning Evaluation – Learning, Experiencing, Developing, & Applying

C. Y. Janey Wang
University of Texas at Austin
janeywon@mail.utexas.edu

Rafael Cota
ITESM Institute, Mexico
rcota@campus.her.itesm.mx

Guillermo Espinosa
ITESM Institute, Mexico
GEspinoz@campus.her.itesm.mx

Abstract: This presentation provides information garnered from a post-faculty development workshop survey regarding the use of evaluation rubrics. Rubric discussions at the UT-ITESM faculty development workshop (in June 2001) focused on six facets of understanding, seven steps to rubrics development, and the employment of rubrics as an alternative assessment method. This paper presents the post-workshop survey and results, as conducted by the researchers, while workshop participants' rubrics samples and assessment strategy suggestions will be presented during the oral presentation.

Introduction

Evaluation of online collaborative learning has been the subject of increased attention in recent years. Online collaborative learning involves both task and social aspects of learning. A long tradition of methodology and approaches regarding task evaluation, including knowledge and skills, exists. Social aspect evaluations, including communication and group collaboration, present special challenges to instructors, and opinions regarding online learning evaluation cover a wide spectrum. Some commentators have proposed "the need for standardized evaluation," while others have emphasized the importance of considering the context and the characteristics of users (Crawley, 1999).

Rubrics are "a type of scoring guide" used to assess more complex and subjective performance, according to Mary Rose (1999). She said rubrics provide "authentic assessment" so the evaluations of student performance are "closer to the challenges of real life than isolated tests." Rubrics that "communicate detailed explanations ... not only benefit students in making them more conscious about their own learning outcomes and process," she said, but teachers also benefit by their ability "to provide an objective basis for assigning grades" and to "involve students more effectively in the evaluation and assessment process" (Rose, 1999). A plethora of literature in support of such measurements abounds. Topics discussed include using rubrics as an alternative assessment (Marzano, 2000), as assessments of authentic and contextual learning (Huffman, 1998), and as performance assessments in an outcome-based system (Mitchell, 1997).

This report was initiated by an instructional designer serving as a facilitator of a three-week cross-discipline and cross-institutional online collaborative learning workshop, ITESM Summer Institute, and is based on a collaborative effort of two workshop participants, a high school principal and a higher education school administrator. The major objectives of this report are to explore workshop participants' perspectives toward the use of rubrics as an alternative assessment tool following their engagement in using rubrics for self, peer, and product evaluations after collaborating in groups. A post workshop survey was conducted to investigate participants' perspectives, experiences, and attitudes toward its future use. A few rubric samples produced by some workshop participants are also presented and analyzed.

ITESM Summer Institute – Discussions on Evaluation

On May 28, 2001, forty-eight ITESM (Monterrey Institute of Technology and Higher Education System) faculty members from throughout Mexico gathered at the University of Texas in Austin for the "ITESM Summer Institute." Hosted by U.T. Austin, this intensive three-week professional faculty development workshop emphasized the integration of technology into curriculum and instruction. Three major aspects of the workshop were cooperative learning, collaborative learning, and faculty development.

The discussions on evaluation were conducted by one of the three major workshop speakers, Dr. Paul E. Resta, a professor at the University of Texas at Austin. Various perspectives and approaches in using rubrics were explored. Workshop discussions included the relevancy, validity, reliability of using rubrics, as well as design considerations and strategies involved in rubric use. According to Resta, an awareness of the varying levels of student understandings is essential when planning the use of rubrics to evaluate online collaborative learning; he identified six facets of understanding to include explanation, interpretation, application, perspective taking, empathy, and self-knowledge.

In collaborative learning settings, students need to explain and communicate their ideas by making their knowledge public. They also must be open to review, discussion, and revision of their ideas within this setting. Through dialogue and discussion, students are able to achieve deeper understandings of conflicting ideas. The second facet of understanding is interpretation. Students need to hear meaningful stories that relate to their real-world experiences. In collaborative learning settings, students need to make their interpretations and understandings public while instructors should provide opportunities for clarifying and contrasting interpretations while promoting exploration and examination of self and others' interpretations. Through this process of exposure to multiple interpretations, students are enabled to modify their interpretations.

The third facet of understanding is application. Learners should ideally be able to demonstrate what and how they have learned and employ their knowledge in complex contexts. Through the provision of real world problems and authentic, collaborative, and complex context within the learning environment, learners should be able to more effectively apply their knowledge and skills within the context of peer monitoring and cognitive apprenticeships. The fourth facet of understanding is the ability to take critical and insightful stands and the ability to provide reasoning and evidence to explain a particular phenomenon. In a collaborative learning situation, students are exposed to diverse viewpoints and conflicting ideas. Instructors who are able to facilitate critical analyses assist students in recognizing the strengths and weaknesses of their ideas, ultimately enabling more meaningful learning to occur.

The fifth and sixth facets of understanding are empathy and self-knowledge. Given the presence of divergent worldviews, students must be able to discern others' values and understand others' viewpoints when collaborating. Through discussion, assumptions are made explicit and further discussion and learning is enabled. The collaborative learning instructor should indicate the limits of the individual's personal understanding and encourage multiple perspectives and dialogue among collaborators, with one of the end results being that all students should come to the realization that they are blinded--to some degree--by ignorance, prejudice, or habitual thought patterns. Based on such understandings, the instructor should have a better understanding of rubric utilization, inclusion factors, and rubric incorporation into instruction.

Seven steps to rubric development were discussed. These are: (1) Determine learning outcomes; (2) Keep it short and simple (include 4-15 items; use brief statements or phrases); (3) Each rubric item should focus on a different skill; (4) Focus on how students develop and express their learning; (5) Evaluate only measurable criteria; (6) Ideally, the entire rubric should fit on one sheet of paper; (7) Reevaluate the rubric (Did it work? Was it sufficiently detailed?). Dr. Resta suggested that instructors should select an authentic and engaging collaborative learning project that results in a real product. In considering the relevancy of the project, the instructor should specify curriculum areas covered and how they relate to students' academic and/or professional goals. The instructors should focus on elements of knowledge that are important and worthwhile to students. Other considerations include: having a clear idea about "learner outcomes;" "learners' entry skills and knowledge;" "project goals and expectations;" and considering how to promote students' higher-level cognitive and critical thinking skills such as reasoning, analysis, problem-solving, critiques, and reflection. In addition, the instructor should promote creativity and divergent thinking by challenging students in authentic activities where students engage and solve problems collaboratively. In determining the rubrics development procedure, Dr. Resta suggested that outcomes should be considered first. The rubric statement should be "short and simple." Items listed should have a particular focus on essential skills and knowledge. In addition to comprehending and mastering knowledge and skills, it is essential that students are able to communicate their ideas and understandings. The instructor should "focus on how students develop and express their learning," and provide proper guidance.

To assess online collaborative efforts, Dr. Resta suggested that self, peer, and product evaluation should be included. Collaborators should be held accountable to each other in order to enhance optimal performance. In order to enhance accountability, members' contributions and quality of work need to be assessed by peers. Instructors should also provide comment sections so students can provide rationales for their rankings and qualitative ratings. In order to enhance product evaluation, individual and group products should be assessed. Instructors should also require students to maintain a portfolio of their contributions, specify items to be included in the portfolio, and identify criteria to be used for portfolio evaluation, Resta said.

Rubrics for Assessment

The merits of using rubrics for assessment are well-documented. Caroline McCullen (1999) refers to rubrics as excellent tools that offer a way for every student to succeed. Students can refer to a specific project or learning activity rubric and discern their ability to work at some level of proficiency. At the same time, students can discover for themselves modes to enhance future performance and proficiency in similar learning activities or projects. Rubrics also provide a way to make subjective activities such as group work, research processes, and presentations objectively evaluated (McCullen, 1999). Social skills and group behaviors are often not amenable to assessment and objective means of evaluating these skills and behaviors are often lacking. Rubrics allow teachers and students to easily outline and evaluate levels of proficiency.

Rubrics can be employed as both an evaluation and a teaching tool. Standards can be set for students' work and used as guidance to assess students' progress and performance. Finson & Ormsbee (1998) said that rubrics refer to specific guidelines on how to score all or parts of an assessment or activity. They identified two forms of rubrics: analytic and holistic. "Criteria that determine the specific type of rubric designed or selected may include the focus or intent of the assessment, the type of instruction preceding assessment, and personal preferences of the individual doing the assessing," they said (p. 80).

Analytic rubrics are used to award points for very specific responses. Analytic rubrics are extremely objective because teachers critique each student response and score the response according to established criteria. These rubrics are more process-oriented than product-oriented. Holistic rubrics are used when overall quality is the focus of assessment. Holistic rubrics are more product-oriented than process-oriented and are primarily concerned with the total performance or product rather than with the individual steps taken to arrive at the final product. In its purest form, a holistic rubric is not used to award points; instead, student products are simply rated according to designated indicators.

A Post-workshop Survey about the use of rubrics

A multiple choice survey was conducted by this study's researchers to discover workshop participants' prior knowledge and use of rubrics as well as their plans to use rubrics for evaluation in their instruction. Participants' plans to use rubrics to evaluate group collaboration, tasks, or overall performance were also surveyed, as were their specific plans on rubric use, the relative likelihood of using rubrics for students' self-evaluation, peer-evaluation, or teacher-evaluation, and the target populations of rubrics employment.

Method

The main purpose of this survey is to gain an understanding of participants' prior knowledge of rubrics and to survey their learning of rubrics through workshop experience in self and peer evaluation using pre-developed rubrics. Further, how workshop participants intend to apply what they have learned about evaluative rubrics in their classroom teaching were explored.

The survey, conducted through a free online survey Web site (http://www.freeonlinesurveys.com), was sent to 46 workshop participants (two of three researchers were not included in this survey). Only 15 responses were obtained because most attendees were on summer vacation. Survey results were automatically calculated and shown on the Web.

In addition to the multiple-choice questionnaire, participants were also asked to provide additional comments via e-mail, telephone, or on-line chats with the researchers. Rubric samples produced by three participants during the workshop were obtained.

Survey questions were in Spanish because 95 percent of the workshop participants are native Spanish speakers. The survey questions were translated into English.

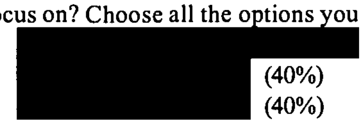
Translated Survey Questions and results

1. Prior to attending the UT-ITESM Summer Institute, were you using rubrics as evaluation tools? Choose only one option.

a. Yes (26%)
b. No (73%)

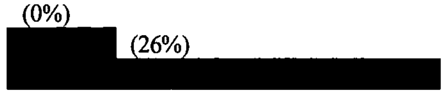
2. Do you anticipate using rubrics as evaluation tools in future courses? Choose only one option.
   a. Yes (100%)
   b. No (0%)
   c. I don't know (0%)

3. If you do anticipate using rubrics as evaluation tools in future courses, which aspect of the task/project/activity will your rubric focus on? Choose all the options you consider applicable.
   a. Process (group collaboration) (53%)
   b. Results (Product) (40%)
   c. Results Presentations/Evaluations (40%)

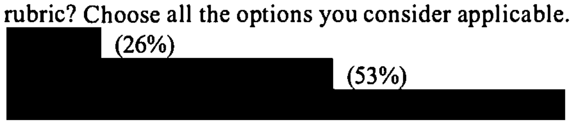


4. If you do anticipate using rubrics as evaluation tools in future courses, what do you want to evaluate? Choose all the options you consider applicable.
   a. Abilities (80%)
   b. Attitudes (86%)
   c. Values (46%)
   d. Knowledge/Content (100%)

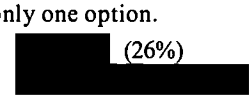
5. If you do anticipate using rubrics as evaluation tools in future courses, how many levels of competencies do you anticipate using? Choose only one option.
   a. Two (0%)
   b. Three (26%)
   c. Four (73%)
   d. Five (0%)
   e. Six (0%)
   f. Seven or more (0%)



6. If you do anticipate using rubrics as evaluation tools in future courses, under which of the following modalities do you anticipate using your rubric? Choose all the options you consider applicable.
   a. Self-evaluation (26%)
   b. Peer evaluation (53%)
   c. Teacher Evaluation (93%)



7. If you do anticipate using rubrics as evaluation tools in future courses, at what educational level do you anticipate using your rubric? Choose only one option.
   a. High School (26%)
   b. Peer evaluation (40%)
   c. Teacher Evaluation (0%)
   d. Continuous Education (0%)



Results

Survey responses indicate participants' consensus on the value of using rubrics for evaluation and suggest that UT-ITESM Summer Institute attendees are united in their perception that using rubrics in collaborative learning is an effective motivator. Of the 15 participants who responded, 60 percent planned to use rubrics with high school students and 40 percent planned to use rubrics with undergraduate students. The results show that only 26.67 percent of the participants had used rubrics as evaluation tools prior to attending the Institute and that the majority (73.33 percent) had not been familiar with the use of rubrics prior to the workshop. Following the workshop, however, all respondents indicated planning to use evaluation rubrics in their courses.

Regarding task aspects and anticipated rubrics use, about half (53 percent) said they would use the rubric to evaluate the group learning process, 40 percent would use rubrics to evaluate results or products, and 40 percent would use rubrics to evaluate students' presentation of their products. These results demonstrate that while the majority of the participants plan to use rubrics as a tool for evaluating group work, some remain focused on such tangible end products as tests or papers. Many of the teachers' responses, nevertheless, reflected an interest in examining group interactions and collaboration. Many participants said they anticipate using rubrics to evaluate teacher-set benchmarks of proficiency. This demonstrates that many participants anticipate teaching in a more structured environment where cooperative learning is utilized, but not the more loosely structured collaborative learning environment. According to Panitz (1996), a collaborative learning approach differs from cooperative learning mainly in the way the learning environment is structured and in the teachers' control of activities.

Regarding future use of rubrics for evaluation, all respondents indicated planning to evaluate knowledge and content; 46 percent planned to evaluate values, 86 percent planned to evaluate attitudes, and 80 percent planned to evaluate abilities. All respondents endorsed the idea that rubrics are an appropriate evaluation tool for assessing content and specific knowledge. The majority thought that rubrics might also be used to evaluate observable behaviors, competencies, and attitudes. Regarding who should conduct evaluations, 93 percent said that teachers should conduct evaluations, 53 percent said that peers should conduct evaluations, and 26 percent said self-evaluation should be employed. This suggests that most participants will continue to evaluate their students on their own, while some will incorporate peer evaluations and students' self-evaluations. Three or four levels of competencies were the only respondent choices, in terms of the levels of competency to be evaluated in designing rubrics, with 73 percent preferring four competency levels and 26 percent preferring three competency levels.

Conclusions

Based on the post-workshop survey responses and participants' rubric samples, it appears that participating teachers are seriously considering using rubrics as an alternative assessment in their classes. These evaluations, participants indicated, extend not only to evaluating students' product, but also to evaluating communication processes and abilities, as well as the ability to present ideas and products. Participants endorsed the inclusion of a wide array of aspects besides knowledge and skills, such as ability, values, and attitudes. Evidence was found to indicate an evolving concept of who should assess students' performance. Participants realized that assessment is not solely the teacher's responsibility, but that peer- and self-evaluation should also be employed. In general, ITESM participants exhibited their new found understanding that rubrics are not only an evaluation tool, but also an instructional tool to be used for scaffolding students' learning, monitoring students' performance, and promoting meta-cognition and critical thinking.

A reform process is currently underway at ITESM, Mexico, centered on emphasizing a student-centered approach, values and attitudes in teaching, and the implementation of technological integration. The institute expects its faculty members to understand the learning process, the relationship between knowledge and the social-emotional aspects of learning, and the role of technology in learning. The institute expects teachers to demonstrate progress in their instructional design utilizing strategies learned, resources explored, and realization of the changing roles of teachers. Throughout the investigation of the paper, we discovered participants' evolving attitude toward evaluation and their willingness to incorporate rubrics for various types of assessment in their classrooms.

Acknowledgement

The author would like to give special thanks to Steven L. Stark for proofreading this paper.

References

Crawley, R. M. (1999). *Evaluating CSCL - Theorists & Users' Perspectives, [Web page].* Available: http://www.bton.ac.uk/cscl/jtap/paper1.htm[2001, August 26]

Huffman, Ellen S. (1998). Authentic Rubrics. *Art Education*, 51, 1, 64-68

Marzano, Robert J. (2000). *Transforming classroom grading.* Alexandria, VA: Association for Supervision and Curriculum Development.

McCullen, Carolinne (1999). *Taking aim: Tips for evaluating students in a digital age.* New York: Bell & Howell Information Service, 19, 48-50

Mitchell, Diana (1997). Assessing out loud. *English Journal*, 86, 1, 97-101

Rose, Mary (1999). *Make room for rubrics.* New York: Bell & Howell Information Service, 108, 30-31

THE CRUCIAL ROLE OF INFORMATION TECHNOLOGY AND KNOWLEDGE-ECONOMY FOR TEACHER EDUCATION

Tsung Juang Wang
National Taipei University of Technology, Taiwan
(e-mail) tjwang@ntut.edu.tw

ABSTRACT:
This paper describes the current status of restructure development in technological and vocational education. The discussion covers Knowledge economy (K-economy) along with ''global village'' needs, and is supported by information about technology standards combined with notions of curriculum, career, ethics, and tradition. The concepts of Information Technology (IT) and K-economy development require input from all mankind, but teacher education professionals can play a particular role here; their reform motivation can often be a decisive argument for their education and workforce development.

Introduction

Life-long learning is the key to education in the 21st century; schools must depend on the directions they plan to take. Such decisions can be difficult especially when schools find themselves faced with the influx of rapid changes, both in society and in the school environment, characterized by the many changes that "move in so many different directions" (Drucker, 1992; 351) so no matter which direction one takes and what pressures we receive from different sectors, education needs to be customized, school-based, relevant, readily available and learner-centered. For this to happen, the place of technology is vital in providing the tools to access information from all corners of the earth, yet this information is useless unless the teachers help the students to turn this into knowledge, and through reflection in time.

In order to answer the challenges of the coming knowledge economy, Taiwan's education system needs to undergo wholesale reform. However, educational reforms need to be accompanied by adjustments in the education system. What are the main difficulties currently being encountered by Taiwan's educational reforms? What kind of social foundations should we be laying for future education?

As the age of the knowledge economy approaches, how should we reform education so as to best answer its challenges -- particularly the reform centering on education legislation? Educational reform in Taiwan has been going on for over a decade, and in fact, its overall direction complements some of the particular needs of the age of the knowledge economy very well indeed.

The Inter-relationship of K-economy and IT in Taiwan

As the technology, the systems, and the economics of education reform advance, we must not lose sight of what education is for. The argument began with is about its moral purpose. The recent economic adjustment is in many ways a blessing in disguise. It reinforces our conviction that we must diversify our economy and promote high-tech, high value-added industries. It is also a timely reminder that our ability to respond to the challenges of the future world depends on how well we can equip our young generation today. We firmly believe that the starting point is education. But, what is the education needs in the new millennium, life-long learning, creativity and devolution of our education system? Our education system must ensure that all our students are information technology (IT) literate, with some of them having the potential to become leaders in the field. This is because IT and the teacher education have changed and will continue to change the world in profound ways with lightning speed. We live in an information age, which offers immense opportunities. And our students have to learn to embrace them.

There must be flexibility in the education system to promote diversity and excellence, and nurture creativity in our students. The system must allow room for schools and educators to innovate, and to respond to the changing demands of parents. It should encourage competition among education providers, and give all stakeholders a proper say in the delivering process.

K-economy and IT Impact upon the Teacher Education

In a knowledge-based economy, the ability of our people to continually learn and upgrade their skills and knowledge is vital to our development and competitiveness. At the basic education level, we offer adults part-time courses ranging from primary to senior secondary. On the vocational side offer part-time skill upgrading courses.

At the tertiary level, we have an Open University, which plays an important role in our efforts to promote life-long learning.

In the past, our education system was very intolerant of different opinions, and shut out non-mainstream educational patterns, and so as we advance towards the age of the knowledge economy, we must put special emphasis on the social foundation that the knowledge economy must have. At the same time as promoting cooperation between industry and education, should we also set up a mechanism to allow participating researchers, or even all of society, to have the chance to share in the fruits of investment in public resources? Then again, that's maintaining social justice, and the knowledge gap may produce many social problems, and so we should formulate some measures, such as making the internet even more widely available, and even cheaper, maybe even expand opportunities for digital education by making it free of charge, and so cut down on the occurrence of related problems.

Educational reform continues to expand in quantity, but we've still yet to see much of an improvement in quality, and the key reason for this is that in the past, compulsory education only ensured nine years of schooling, it didn't promise that you'd have learnt anything after these nine years, and so many junior high school graduates would be doing their military service without even being able to write their names very well. It's very important that we solve problems to do with teaching staff, teacher education. Our teachers are using yesterday's knowledge to teach today's children how to handle the society of the future, and if teachers don't treat further self-improvement as a duty and an obligation, how will the students that they teach be able to answer the demands of contemporary society?

In ongoing policy discussion of educational reforms, people emphasize the impacts of globalization and try to make every effort to adapt their education system as well as curriculum and pedagogy to prepare for it. Unfortunately they often ignore the necessity and importance of localization and individualization or they put these three processes in a contradictory position. Without localization in education, they will be unable to meet the local needs, involve community support, and enhance site-level motivation and initiatives (Kim, 1999; Cheng, 1996). Without individualization in education, all efforts of reforms will be unable to meet the needs of students and teachers and to motivate them to be effective in teaching and learning. In other words, they will not be able to elicit the necessary initiative, imagination, and creativity from school members and community members, and to make contribution to the process of globalization, not just receiving its impacts. Therefore, globalization, localization, and individualization all are necessary components in current educational reforms.

Conclusion

We need to rethink and re-engineer our school education and teacher education. If we believe our world is moving towards multiple globalizations and becoming a global village with boundless interactions among countries and areas. Our new generations should be expected as a contextual zed multiple intelligence person in such a fast changing and interacting global village. The development of the society should be multiple towards a learning multiple intelligence society. The aims of education should be to develop students as a multiple intelligence citizen who will creatively contribute to the formation of a multiple intelligence society and a multiple intelligence global village with multiple developments in technological, economic, social, political, cultural, and learning aspects.
If IT is to bring a real added value to education, then its success lies in the innovative methods for designing, planning and conducting network actions in which innovation lies not just in the mere presence of a new technology but rather in revising certain teaching processes or in creating new ones based on the new technology. Furthermore, IT in most of the countries was seen as something that should be added on to the curriculum rather than an integral part of curriculum planning.

Reference

Brown, P., & Lauder, H. (1996). Education, globalization and economic development. *Journal of Education Policy, 11*(1), 1-25.
Brown, T. (1999). Challenging globalization as discourse and phenomenon. *International Journal of Lifelong Education, 18*(1), 3-17.
Cheng, Y. C. (1996). *School effectiveness and school-based management: A mechanism for development.* London, UK: Falmer Press.
Daun, H. (1997). National forces, globalization and educational restructuring: some European response patterns. *Comapre, 27*(1), 19-41.
Drucker, P.F. (1995). *Managing in a time of great change.* Oxford: Butterworth Heinerman.
Gardner, H. (1993) *Frames of Mind: The Theory of Multiple Intelligences*, Fontana, London.
Kim, Y. H. (1999). Recently changes and developments in Korean school education. In Townsend, T., & Cheng, Y. C. (eds). *Educational change and development in the Asia-Pacific region: Challenges for the future.* (Pp. 87-112). The Netherlands: Swets and Zeitlinger.

Utilizing *Blackboard* to Engage Teacher Candidates in Higher-Order Thinking

Saundra L. Wetig
College of Education
University of Nebraska at Omaha
United States
swetig@mail.unomaha.edu

Abstract: The infusion of technology into classroom activities has been demonstrated to enhance student learning (Christopherson, 1997; Roblyer, 1998). The value added comes from the potential for anytime/anywhere learning, student communication, and increased access to multiple sources of current information. During the Fall 2001, a web program titled *Blackboard* was made available to all students and faculty members across the University of Nebraska at Omaha (UNO). This paper highlights how *Blackboard* will be implemented in a level I field experience course in the College of Education for the Spring 2002 semester. This work-in-progress is not an empirical study, but instead, an attempt by the instructor to help students think more critically regarding classroom observations made in a level I field experience course.

Background: *Blackboard*

Today's education landscape is characterized by a greater demand for anytime/anywhere learning. As we move into the 21st century, technology has become a significant part of how we train teacher candidates. The new millennium requires teacher candidates to practice both the art and science of teaching in new and different ways. During the Fall 2001 semester the UNO Information and Technology Service (ITS) provided faculty and students with the opportunity to utilize the web-based server software system titled *Blackboard*. *Blackboard* serves 5.4 million active users, with more than 1,900 'live' institutions. UNO is one of eleven educational institutions in Nebraska utilizing *Blackboard*. A sample of tools available through *Blackboard* include:

1. *Calendar* – Users may manage their course, organization, institution and events through this tool.
2. *Tasks* – Organizes projects, defines task priority and tracks status.
3. *Course Documents* - An area to place documents of various types for students to view.
4. Assignments – Lists the due date and description of class work. Quizzes and exams can be placed in this area for students to access.
5. *Discussion Board* – Instructors may add forums, and allow students to read messages that are organized into threads. Students can read and respond to both the instructor's posts and the posts of other students in the class. This is a great tool to promote discussion among students about class subject matter outside of class. Participants do not have to be logged on at the same time.

Integrating *Blackboard* into an Instructional Systems Course

The College of Education (COE) at UNO has undertaken a review of its course offerings in response to emerging national standards. The faculty of the college has designed a program for teacher education candidates that utilize a systematic, experience-based approach to develop and demonstrate requisite knowledge, skills and dispositions. The outcome of this curriculum is "The Teacher as Orchestrator of the Learning Environment." Instructional Systems is a course, which acquaints teacher candidates with the basic aspects of curriculum design and implementation. Topics integrated into the course include: a) instructional delivery strategies based on the assessment, prescription, implementation, and evaluation (APIE) model of the COE, and b) educational technology selection, design, production, utilization and evaluation. Instructional Systems seeks to help teacher candidates understand the role of a teacher as the orchestrator of the learning environment and the integral part these topics play in that role.

Students in Instructional Systems are required to complete twenty observational hours in an assigned school setting. The placements are made in socio-economic diverse elementary, middle, and high school settings. Throughout the twenty hours, teacher candidates are required to complete field reports.

The field reports are guided by questions based on the clinical aspects APIE model. Candidates turn their reports in as word-processed document to which they receive feedback only from the instructor. During the Spring 2002 semester student reflections will use on-line submission through the Discussion Board tool.

Data Collection Through *Blackboard's Discussion Board*

Discussion Board will be utilized as an additional communication tool, moving students beyond routine class discussions. Following observations and participation in the schools, teacher candidates will be required to respond to threads (set up in forums) based on the elements of APIE. Students will post their responses to each thread in *Discussion Board*. In addition to personal posts, each student will be required to respond to three classmates threads. An example forum based on the elements of assessment and prescription:

1. Element: Assessment: Topic: School and Learning Environment
   DESCRIBE the environment of the school itself (hallways, teachers' lounge, administrative offices, classrooms, etc.).
   OBSERVE the classroom environment (teacher's desk, students' desks, seating arrangements, walls, windows, attitudes, etc.).
   ANALYZE the answers you wrote to the first two questions above. DISCUSS both the possible advantages/disadvantages to the two environments. Provide insight as to how your future learning environment might look like.
2. Element: Prescription: Topic: Classroom Procedures and Routines
   DESCRIBE the schedule for each day of the week in you classroom.
   DESCRIBE the routines used each day (lining up for recess, lunch, naps, etc.).
   ANALYZE the structure and routines of the day and explain how and why you think they are conducive to learning. If you think the procedures inhibit learning, explain why and how.

The discussion board will be used in a manner similar to a virtual chatroom. A benefit of *Blackboard* is that it was designed for asynchronous use. Users do not have to be available at the same time to have a conversation. A key feature of the discussion board is that user conversations are logged and organized. Conversations are grouped into forums that contain threads and all related replies.

Conclusion

During the next semester efforts will be concentrated in engaging teacher candidates in higher-order/conceptually based dialogue based on the their observations and the observations of their classmates in a level I field experience. By requiring students to engage in self-reflection and evaluation it is hoped they will begin making connections regarding the pedagocial aspects of assessment, prescription, implementation, and evaluation.

As we move into the 21st century, we have an obligation as teachers to help our teacher candidates become higher-order/conceptually based learners/thinkers. It is critical for teacher educators to continue personal modeling of technology as an aid to instruction and as a tool to engage students in higher-order/conceptually based dialogue. Jackson (1986) says in his discussion on transformative teaching, "it is essential to success within that tradition that teachers who are trying to bring about transformation changes personify the very qualities that they seek to engender in their students" (p. 124). It is hoped that as teacher candidates are engaged in purposeful, yet guided online dialogue that they will begin in their own ways to become higher-order/conceptually based learners in the experience.

References

Christopherson, J. (1997). The growing need for visual literacy at the university. Proceedings of the International Visual Literacy Association 1996 Annual Meeting, Cheyenne, WY (Eric Document Reproduction No. ED 408 963).

Jackson, P.W. (1986). The practice of teaching. New York: Teachers College Press.

Roblyer, M.D. (1998). Visual literacy: Views on a new rationale for teaching with technology. Learning and Leading with Technology, 26(2), 51-54.

Computers, Technostress and Breathing

Lamar V. Wilkinson
Department of Psychology
Louisiana Tech University
United States
Lamar@latech.edu

Walter C. Buboltz, Jr.
Department of Psychology
Louisiana Tech University
United States
Buboltz@latech.edu

Barlow Soper
Department of Psychology
Louisiana Tech University
United States
Soper@latech.edu

Tony Young
Department of Psychology
Louisiana Tech University
United States
Tyoung@latech.edu

Lori Lindley
Department of Psychology
Louisiana Tech University
United States
Llindley@latech.edu

Abstract: Although technology continues to flourish at an unprecedented pace and influence society, its impact on society and individuals is just beginning to be investigated. As a result of technology becoming an integral part of everyday life, research findings indicate individuals are experiencing a great deal of related stress and anxiety (technostress) concerning technology. Presented are breathing techniques that help individuals cope effectively with technostress and a rationale of why they work.

Political, social, and economic issues, as well as technological advances, are generating major changes in individuals' behavior and society. In this age of computers and electronic media, researchers have been investigating the impact of technological changes on individuals . This paper will illustrate an effective way of coping with technostress by helping individuals understand the importance of breathing.

Modern life has become so complicated, harried, and crowded that individuals feel as if they must constantly scurry to survive.. Developing world events, concerns about the future and technologically driven everyday life has created tremendous strain on society, and specifically for individuals using or expected to use technology. Physical, social, and mental boundaries essential for our well-being are being constantly assaulted by technological stimuli. Individuals' senses are being bombarded with technological sounds and sights (beeps, pagers sounding off, cell phone ringing, and unsolicited conversations at any time and place digital alarm clocks, programmable toasters, smart credit cards, ATMs, computers, Internet, video games, VCR programming, etc.) leaving us irritable, distracted, unable to concentrate. Technological bombardment has generated tremendous technostress for some individuals.

Negative consequences of technology and computers may be pandemic. Yet, stress is not limited to technoexposure or threat of exposure Timothy Jay (1981) discusses extreme forms of technostress, i.e., abject fear of computers, and coined the term "computerphobia." Weil and Rosen (1997) found that one-third of university students were computerphobic. Craig Brod (1984) coined and defined the term technostress as "a modern disease of adaptation caused by an inability to cope with the new computer technologies." However, Weil and Rosen (1997) think of technostress as any negative impact on attitudes, thoughts, behaviors, or body physiology caused either directly or indirectly by technology. Individuals must begin to learn and make use of ways to help feel less frustrated and pressured, while coexisting with the rapidly expanding world of technology.

Individuals struggling with technological changes respond with extreme muscle tension and instinctive restricted breathing which causes individuals to breathe shallowly, more in the chest than from the diaphragm, reducing oxygen intake and exhalation of toxins. Aware of this process, many eastern philosophers believe that natural, healthy breathing is a powerful antidote and coping mechanism for mediating everyday stress. Natural breathing techniques can be applied and used in almost any setting at nearly any time thus decreasing and controlling technostress levels. Individuals must relearn how to breathe correctly, set aside effective breathing time each day and make deliberate, conscious choices to regaining their natural way of breathing. This involves awareness of, focusing on faulty breathing patterns and replacing them with correct, healthy ones Correct breathing before, during, and after any experience, situation, or simply while sitting at the computer will facilitate calm, warm and energetic feelings. Thich Nhat Hanh*(1975)* indicates that mindfulness is the life of awareness which we can master and use to restore our breathing. Breathing is a natural and extremely effective tool that can help focus ones mind and maintain mindfulness. As the mind becomes scattered or the body becomes tense, one may use healthy breathing to take hold of life and moderating technostress.

Even though the healthy breathing process appears to be elementary many do not do it when it can be most helpful; yet, the resultant advantages of relearning to breath can have a profound effect on individual lives. In today's technologically advanced society, mastery of breathing is extremely important for living. The dynamics of breathing and various breathing techniques available deserve much more attention in Western society. Wilkinson, Buboltz & Mathew(2001) presented numerous breathing techniques for easing test anxiety. One breathing technique example, a few minutes devoted to "slow diaphragm respiration" (SDR) invigorates the body and shifts thoughts to a relaxed state. A person can make use of SDR while sitting at the computer desk. SDR begins by closing the mouth and breathing deeply through the nostrils. One places a hand on the diaphragm just below the ribcage and takes deep breaths so the hand moves out and back as the lungs inflate and deflate. The shoulders should not lift, but remain stationary. While paying close attention to what happens, one draws in breath and lets it out. If while practicing one encounters excitement or nervousness about breathing, simply relax and think of something pleasant for a moment. After thinking of something pleasant, and when breathing has slowed to normal, resume the exercise. The slowing down respiration technique has very important implications for alleviation of muscle tension, anxiety and reducing technostress.

References:

Brod, C. (1984). *Technostress: The human cost of the computer revolution.* Reading, Mass.: Addison-Wesley.

Jay,T. "Computerphobia: What to do about it?" *Educational Technology* 21 (1981):47-48.

Thich Nhat Hanh(1975) *The miracle of mindfulness: a manual on mediation*, Beacon Press Books, Boston, Massachusetts.

Weil M. & Rosen L. (1997). *Technostress: Coping with Technology at work, at home and at p*lay. John Wiley & Sons, Inc.

Wilkinson, L.V., Buboltz, W.C. & Mathew, K.L. (2001). Use of Breathing Techniques to Ease Test Anxiety, Guidance and Counseling Journal, Vol. 16: 3, Spring, 2001.

Technology and Technophobia: Method for Overcoming

Lamar V. Wilkinson
Department of Psychology
Louisiana Tech University
United States
Lamar@latech.edu

Walter Buboltz
Department of Psychology
Louisiana Tech University
United States
Buboltz@latech.edu

Eric Seemann
Department of Psychology
Louisiana Tech University
United States

Jonathan Schwartz
Department of Psychology
Louisiana Tech University
United States

Gina Gibson
Department of Psychology
Louisiana Tech University
United States

Abstract: Individuals are being bombarded with new and ever changing technologies in today's society. Research appears to have focused primarily on the use of technology to enhance education and productivity. Little research has focused on how, for some individuals, technological usage may have a negative impact on their attitudes, thoughts, behaviors or bodily physiology. This article reviews the development of Technophobia and the use of Wolpe's Systematic Desensitization methodology to help individuals overcome their computer fears.

Today, there is more technology than ever before existing at home, at work, and play. Individuals are being bombarded with new and ever increasing changing technologies, just to make it through a routine day. However, there are millions of individuals who are not comfortable with technology. The purpose of this paper is to illustrate how increased technological usage has created for some individuals, technophobia. In order to help these individuals overcome their technophobia, Wople's Systematic Desensitization has been found to be an effective method to help individuals overcome their fear of computers or other phobias.

The increasingly sophisticated technology (in the workplace, home, and play) involves the use of machines by all individuals. Technologies are altering people's lives in a very positive way for most individuals. Yet for others, technology is having an adverse effect by creating stress in their lives. Jay (1981) found some individuals had an extreme fear of computers and coined the term 'Computerphobia." Later, Brod (1984) coined the term "Technostress" for individuals having difficulties with technology and defined it as "a modern disease of adaptation." However, Weil and Rosen (1997) do not consider it a disease but define it as "any negative impact on attitudes, thoughts, behaviors or body physiology that is caused either directly or indirectly by technology. These authors perceive "TechnoStress" as an irritation that individuals feel as their boundaries are constantly being invaded by technology. In their investigation of individuals experiencing technostress, Weil and Rosen found that people's reactions to technology typically fall into three "Techno-Types" (1) Eager Adopters love technology, first to buy new technology equipment, and find it challenging and exciting. These individuals expect to have problems with technology and solve the problem or find someone that can. Eager adopters usually make up 10 to 15% of society; (2) Hesitant "Prove It" does not find technology fun or challenging, hesitate to invest in technology and have to be proven its worth to use it. If you can convince them they will consider it. Hesitant makes up 50 to 60% of society; and (3) Resisters avoid technology; they want nothing to do with it; they feel intimated and embarrassed as well as inadequate when handling new technology. In fact, any difficulties make them run further away each time sometime else goes wrong. The resister makes up 30 to 40% of society. The Resisters are individuals who have strong fears toward technology (technophobic).

For some individuals technological changes create problems that prevent them from becoming technological competent and were called "Computerphobic."; however as other products of technology has become common, the term evolved into "Technophobia". Both these terms describe an individual's negative reaction to technology. An excellent example of a technophobic individual was illustrated in Wilkinson's (1997) article entitled, "An educators journal toward technical competences". In his striving to become technologically competent, several stages evolved that were identified and recognized as helpful for individuals overcoming fear of computer usage. They are: (1) need for a firm commitment to learn about computers; (2) recognizing the importance of learning computer language; (3) purchasing and reading computer books for additional technical knowledge about computers hardware, software and operating systems; (4) research required, knowledge accumulated and learning needed for purchasing a computer, and (5) applying acquired computer skills to work, home and play. These stages are useful and illustrate indirectly the gradual and systematical desensitizing process necessary for reducing computer fears.

Essentially a person's attitudes, emotions and behaviors toward technology play an important role in a person becoming "Technophobic". A key question is "What can be done to help these individual handle their fear of working with computers?" Systematic desensitization is a therapy developed by Joseph Wolpe to inhibit fear and suppress phobic behavior (a phobia is an unrealistic fear of an object or situation). His method of treatment can be used to help individuals overcome their fear of technology. Wople's treatment is based on Pavlovian conditioning principles and represents an important application of classical conditioning. Wolpe's therapy uses relaxation to counter human phobias is called *systematic desensitization*. Basically, systematic desensitization involves an individual using relaxing while imagining the fear-inducing stimuli that prevent productive behavior. To help an individual overcome their fears, Wolpe used a series of muscle relaxing exercises. These exercises involve tensing and then relaxing a particular muscle. The person tenses and relaxes each major group in a specific sequence. The assumption is that tension is related to fear and so using tension reducing exercises is relaxing and helpful in overcoming a phobia. The desensitization treatment consists of four separate phases: (1) individual are instructed to construct a graded series of fear inducing scenes related to computers and ranks them in a hierarchy that produce the lowest level of fear to those that produce the highest level of fear; (2) training the individual to learn to relax; (3) actual counter conditioning involves instructing the person to relax, then to imagine as clearly as possible the lowest scene on the hierarchy of computer fears, and (4) assessment process involves testing of the effectiveness of desensitization by having the individual encounter the fear object.

References

Brod, C. (1984). *Technostress: The human cost of the computer revolution.* Reading, Mass.: Addison-Wesley.

Jay, T. "Computerphobia: What to do about it?" *Educational Technology* 21 (1981):47-48.

Weil M. & Rosen L. (1997). *Technostress: Coping with technology at work, at home and at play.* John Wiley & Sons, Inc.

Wolpe, J. (1958). *Psychotherapy by reciprocal inhibition.* Stanford. Calif.; Stanford University Press.

Wilkinson, L.V., (1997). An educator's journey toward technical competency. *Society for Information Technology and Teacher Education Annual.*, Vol 1. 110 – 113.

Comparing Themes of Critical Reflection from Face-to-face and On-line Discussion in a Course for Teacher Education Students

Yuejin Xu and Asghar Iran-Nejad
University of Alabama
United States
yxu@bamaed.ua.edu

Abstract: Electronic discussion is found to be better than face-to-face discussion in promoting equal participation among students and in increasing language ability. However, few studies have been conducted to examine whether the use different mode of interaction makes a difference in critical reflection among learners, especially among teacher education students. The purpose of this study is to compare and contrast students' on-line discussions recorded in WebCT Chat room and face-to-face audio taped discussions.

Introduction

Comparing and contrasting two modes of learners' interaction, that is, face-to-face and electronic, has been an evolving focus in the field of language acquisition (Kelm, 1992; Kern, 1995; Warschauer, 1996). Electronic discussion is found to increase more equal participation within students. Moreover, "students used languages which is lexically and syntactically more formal and complex in electronic discussion than they did in face-to-face discussion" (Warschauer, 1996, p. 7). However, does the use of different mode of interaction make a difference in critical reflection among learners, especially among teacher education students? This study addresses this question by analyzing students' real-time online discussions recorded in WebCT Chat room and face-to-face audio taped discussions over a period of a semester following a ground theory (Madill, Jordan & Shirley, 2000). To our knowledge, the present study represents the first attempt to explore the effect of face-to-face and on-line discussion on critical reflection.

Concept of Critical Reflection

As pointed out by Imel (1998), there has been a lack of a common definition for critical reflection, which actually led to the interchangeable use of the terms *reflection* and *critical reflection*. However, many people would agree that critical reflection "involves actively monitoring, evaluating and modifying one's thinking and comparing it to both expert models and peers" (Lin, Hmelo, Kinzer & Secules, 1999, p. 43). To engage in critical reflection, learners need "move beyond the acquisition of new knowledge and understanding, into questioning (of) existing assumptions, values, and perspectives" (Cranton 1996, p.76). Two dimensions are central to critical reflection: problem recognition (PR) and solution recognition (SR) (Iran-Nejad, 1998). Good reflective practitioners should be able to demonstrate either keen examples of cross-domain problem recognition anchored in within-domain solution recognition or keen examples of solution recognition anchored in within-domain problem recognition. In other words, learners need not only know what to know but also how to know and when to know.

Critical Reflection and Technology

Technology can play an important role in supporting learners' critical reflection. In their paper, Lin, Hmelo, Kinzer and Secules (1999) proposed four ways that technology can scaffold reflection, namely, process displays, process prompts, process models, and a forum for reflective social discourse. In the first three ways, reflection is more regarded as an individual activity, whereas in the last one, reflective social discourse, "it is clear that reflection can also be a social activity and can be influenced by a community" (p. 53). WebCT ® is a kind of software that offers real time online chat as well as other features. With its capability to trace record and display what have been input by its users, WebCT chat offers a great opportunity for learners to interact and reflect and to generate more reflective social discourses. Therefore, we hypothesize that WebCT Chat could excel or at least match the traditional face-to-face mode of interaction in group discussions for critical reflection.

The Study

Participants

The participants in this study were 8 students enrolled in an educational psychology course for teacher education students participated in this research. They were randomly assigned to one of two groups. Both control and experiment group were using the same syllabus, having the same amount of instruction, and doing the same tasks (a portfolio, a midterm, and a final). However, in the control group, students were assigned class time to conduct face-to-face discussion on group mind-changing experiences. Their discussion was audio taped and later transcribed. Whereas in the experiment group, WebCT recordable Chat rooms were created for each group to chat over the internet on their group mind-changing experiences.

Procedures

First, each participant wrote a general reflective essay. Then, they shared their reflective essays among their group members either via email or hard copy. Second, as they read their group members essays, they wrote down all the questions that came to their mind. Third, they prepared two paragraphs, proposing a group mind-changing experience for consideration during the group discussion. One paragraph discussed the prior-to-change thinking of the topic and the other paragraph the thinking after the mind-changing. Finally, each group met for a discussion (face-to-face vs. real time on-line chat) to exchange questions and decide a common shared topic for their next reflective essay.

Analysis

Transcripts in WebCT Chat and in face-to-face discussion were collected as our data. They were first compared by the amount of time, amount of discussion (words), turns. Then, they were read and re-read to identify categories, themes and the position in the aforementioned two dimensions of critical reflection.

Findings and Conclusions

Our analysis yielded few positive findings. As far as the time, amount of discussion (words), turns, are concerned, the face-to-face group generated more discussion than the on-line chat group in less time. Moreover, compared to the online chat group, the face-to-face group had more turns among its group members. The Appendix shows one recorded group discussion in WebCT Chat, in which we can see that the chat was actually dominated by one participant.

Concerning the themes, categories, and examples in critical reflection, we didn't find any major difference in two groups so far, which actually contrary to our hypothesis.

Yet, we really cannot conclude that face-to-face is better than on-line real time chat to support critical reflection because this study has some limitations. One major limitation is the small sample size. Also, it would be better if other measures of critical reflection are adopted and used.

Reference

Cranton, P. (1996). Professional development as transformative learning: New perspectives for teachers of adults, San Francisco: Jossey-Bass.

Imel, S. (1998) Teaching critical reflection. REIC: Alerts.

Iran-Nejad, A. (1998) Wholetheme Educational Psychology Project. (Unpublished Project Material)

Kelm, O. (1992). The use of synchronous computer networks in second language instruction: A preliminary report. *Foreign Language Annals, 25(5)*, 441-454.

Kern, R. (1995). Restructuring classroom interaction with networked computers: Effects on quantity and quality of language production. *Modern Language Journal, 79(4)*, 457-476.

Lin, X.., Hmelo, C., Kinzer C. K., & Secules, T. J. (1999). Designing technology to support reflection. *Educational Technology Research & Development, 47(3)*, 43-62.

Madill, A., Jordan, A. & Shirley, C. (2000). Objectivity and reliability in qualitative analysis: Realist, contextualist and radical constructionist epistemologies. *British Journal of Psychology, 91*, 1-20.

Warschauer, M. (1996). Comparing face-to-face and electronic discussion in the second language classroom. *CALICO Journal 13(2)*, 7-26.

Appendix: One Recorded Group Discussion in WebCT Chat

*-**
New session has begun in Room1.
Time: Wed Sep 26 19:27:47 2001
*-**
*+**** C-3 entered Room1. Time:Wed Sep 26 19:27:47 2001
*+**** C-1 entered Room1. Time:Wed Sep 26 19:27:48 2001
*+**** C-2 entered Room1. Time:Wed Sep 26 19:27:52 2001
C-1>>hi
*+**** C-4 entered Room1. Time:Wed Sep 26 19:27:58 2001
C-2>>hey
C-3>>
C-4>>
C-3>>What is the beststrategy for learning a teacher can use
C-2>>all of them
C-3>>how do we as teachers intertwine art/science in our every day teaching experience
C-1>>let's chat about what we wrote our two paragraphs on
C-3>>I feel teaching is definately a science and that the teachers who try to bring in the artsy influence are the ones that will prosper with learning
C-2>>
C-2>>this computer stuff sucks
C-2>>I cant work it
C-2>>I don't know about all that other stuff but I think we should all write on what hope wrote
C-3>>i wrote one of my paragraphs on the topic of art versus science
C-3>>i personally like this topic the best
C-2>>what do you think about grouping?
C-4>>i think we should write on what Hope wrote too
*-**** C-2 left Room1. Time: Wed Sep 26 19:40:05 2001
*+**** C-2 entered Room1. Time:Wed Sep 26 19:40:07 2001
C-2>>this computer stuff is difficult
C-1>> i wrote my paragraphs on the importance of the way students are grouped for group work
C-3>>i feel that the personality with teaching really only concerns with the grade level you are involved with
C-3>>also if we do decide to go with this topic we should involve good vs. bad as well
C-2>>the importance of personality probably decreases some with the students' ages but I feel that it is always somewhat important to effectiveness of the teacher
C-2>>I think that is the best way to go
C-1>>can someone with no desire to become a teacher still be a good teacher
C-2>>I think that the desire to learn influences the ability to learn and I think that someone who does not desire to learn to become a good teacher would not learn to become a good teacher

C-3>>that goes back to the topic of art vs. science, is that teacher capable of teaching and does he or she have an influence or skill that can help our kids learn
C-1>>a lso, do all good teachers have relatively the same teaching methods, or can they still be as different as night and day
C-4>>teaching is something you have to want to be a part of
C-2>>I think they can all be different what's good for the goose is not necessarily good for the gander
C-2>>I don't think that anyone who does not have a love for teaching is capable, if you don't want to do it, you won't do a good job of it
C-3>>that is correct someone has to want to be a teacher and i feel you can not make themwant to teach but i did not want to tbew a teacher and here i am at 23 with a degree in business
C-1>>you are old!!!!
C-3>>old and dirty
C-4>>nobody has the same teaching skills, everybody is different
C-2>>I would say style instead of skills, we should all learn the same skills
C-2>>you're mean
*+**** C-3 entered Room1. Time:Wed Sep 26 19:54:47 2001
*-**** C-3 left Room1. Time: Wed Sep 26 19:54:56 2001
C-1>>so lets decide on a topic you guys
C-2>>I think we should do good v. bad
C-1>>what part of it
C-4>>???
C-2>>do we have to have a part?
C-1>>we can focus on the personality aspect of it
C-3>>this all falls under personality and art v. science
C-2>>true, but is that enough to make a paper
C-4>>sure
C-3>>those are just general assumptions under those categories
C-2>>I can see where art v. science and good v. bad contain the personality aspect but how do we tie that together?
C-1>>write a paper on how much emphasis is put on personality at different age levels and how that reflects back to art vs science
C-3>>ok ok ok ok
C-1>>can i get a woo hoo!!!
C-2>>woo hoo
C-4>>sounds good to me
*+**** C-3 entered Room1. Time:Wed Sep 26 19:58:23 2001
C-1>>aight, lets write those papers
*-**** C-3 left Room1. Time: Wed Sep 26 19:58:29 2001
C-2>>sounds good to me
*-**** C-2 left Room1. Time: Wed Sep 26 20:01:19 2001
*-**** C-4 left Room1. Time: Wed Sep 26 20:01:20 2001
*-**** C-1 left Room1. Time: Wed Sep 26 20:01:43 2001
*-**** C-3 left Room1. Time: Wed Sep 26 20:03:03 2001
****
Session in Room1 ended (all participants have left).
Time: Wed Sep 26 20:03:03 2001
****

Internet in Chinese Education, Where to Go?

Robert Z. Zheng, Ed.D.
Educational Studies Division
Marian College, USA.
rzheng@mariancollege.edu

John R. Ouyang, Ed.D.
Bagwell College of Education
Kennesaw State University, USA
rouyang@ksumail.kennesaw.edu

Abstract: This paper will study (1) the various stages of Internet access in China: from censorship to limited self-autonomy, (2) instructional use of the Internet in China, (3) the digital equity issues which hinder the instructional use of Internet in China. Further suggestions will be made regarding healthy development of the instructional use of the Internet in China. They include: Internet policies, funding, digital access, and the geographical balance of technology distribution.

From Censorship to Limited Self-autonomy

The instructional use of Internet in China has come a long and hard way. Its development can be subsumed into three stages: (1) censorship, (2) half-censorship, and (3) limited self-autonomy. Starting from 1993, there were a series of changes in government policy regarding the use of technology in education, including the Internet. Realizing that technology, especially information technology, was the key to productivity and national economic growth, the Central Committee of the Communist Party of China issued *the Guideline to Educational Reform and Development* and shortly afterward, enacted the *Education Law of the People's Republic of China* in 1995. Both emphasized the need for reform in the existing education system and that the government should support the use of broadcasting, television, and other distance education avenues to create an environment for life-long learning (Chen, 1999).

A recent study shows that from 1994 to 1997, the government appropriated major funding to network infrastructure construction. Four major network systems were established: CHINANET, China Science Academy Network, Golden Bridge Network by the Ministry of Education, and the Ministry of Information Industry (He, 1998). These network systems connected more than 300 universities, colleges, and research organizations. They also provided network services that connected provinces throughout the nation. In the meantime, the Internet access became no longer a privilege that belonged only to a few research institutes and universities. More people were able to communicate via email through their Internet Service Provider and surf the Internet at home or at work, although such access was still under government control with sites filtered and censored.

As China became more and more involved with the world economy, exchange and communication with Western countries and organizations have increased exponentially in the areas of commerce, culture, and academic research. In April 1997, the government sponsored the National Conference on Information Technology in ShenZhen, a liberal and open city in southern China. Chinese Vice Premier Zhou Jiahua spoke at the conference emphasizing that (a) the central and local governments put the management of information and the construction of database for information management at the top of their agendas, and (b) schools and education organizations developed Web-based instruction and Web-based assisted materials for students in the classrooms (He, 1998). As a result, Internet business flourished. More Internet Service Providers (ISPs) became available. By the end of July 2001 there were ten major Internet Service Providers in China with UNTNET and CNCNET being the two leading Internet Service Providers in China. The government has also loosened its Internet policy allowing foreign investment in Chinese telecommunication services although the government ordained that it must own at least 51 percent of shares in any Chinese IT company.

The opening of the Internet market granted, for the first time, Chinese people self-autonomy in the use of the Internet; it not only allowed people to access the Internet but also to develop their own instructional materials on the Internet. The statistics by China Internet Network Information Center (CNNIC) indicate that the Internet users in China have increased from 620,000 in 1997 to 26.5 million by July 2001(CNNIC, 2001). In the meantime, the Internet market becomes more diversified in terms of the domains registered under the CN.

Nonetheless, the growth of Internet market and the self-autonomy granted to people are accompanied by an increased restriction and regulations imposed by the Chinese government. In April 2000 the Ministry of Education (MOE) of China published Provisional Regulations on Modern Day Distance Learning. At the same time, the Ministry of the Information Industry issued Measures for Administration of Places of Business for Internet Access Services. Both documents "regulate and guide" the Internet activities in China. The Provisional Regulations by MOE stipulate, for example, that the online school activities must be governed by laws and regulations while allowing some kind of autonomy in areas such as admissions, instruction and the issuance of certificates of completion.

Internet i n Chinese Schools

The instructional use of the Internet in China has also undergone ups and downs. With no exception, it has been under strict supervision by the Ministry of Education of China. The survey studies by China Internet Network Information Center (CNNIC) from 1997 to 2001 indicate that Internet growth has been slow in education. In fact, the percentage of EDU domains under CN has been decreasing within the last few years. In spite of that, the Internet as an instructional tool has found its way in the classrooms of both higher education and elementary and secondary education.

At colleges and universities, the Internet is used in instruction in several different ways. First, it is used as an assistive tool for information search and communication. Instructors like to use email to communicate with students and encourage them to use the Internet to search information for their projects. Second, the Internet is used as an alternative avenue to traditional course delivery. In Nanjing University, for instance, the Department of Foreign Languages and Literatures developed a proprietary Web shell-ware which enables the instructors to develop their online ESL courses. Third, there is in recent a trend to form collegiate collaboration via the Internet. Eight major universities led by Nanjing University, have developed an Internet based educational network system for information sharing and collegiate collaboration.

Like higher education, elementary and secondary schools use the Internet as a tool for information search and communication. The Internet is essentially an extension of the school library. Although there is a demand from teachers who prefer to have their own instructional web page, few teachers know how to build their own instructional web pages. Some provinces started a pilot program by establishing a centralized technology hub which provides technical support to local schools. For example, the Educational Technology Center in Fujian Province has created an Internet program that has ignited far-reaching reform throughout the country. The project includes an online expert teacher database of master lesson plans and supplemental instructional materials that teachers in local schools can access for use in their classrooms. The Center also offers online courses to high school students who, upon completion of the courses, will be awarded a high school diploma accredited by the Province (Zhang, 2001).

Nonetheless, the instructional use of the Internet in China is uneven in terms of distribution, accessibility, and digital equity. The access and equity issues have been one of the major concerns that hinder the Internet development in education in China.

Distribution. China has an uneven distribution of technology and resources. Geographically, the coastal cities and provinces are well developed with more advanced technology and infrastructure, and therefore have better access to new technologies than the inner cities and provinces. The CNNIC January 2001 report showed that the nine coastal cities and provinces accounted for 70.55 % of total 265,405 websites in China (CNNIC, 2001). Obviously, the imbalance of technology resources in distribution gives rise to the issues of accessibility and digital equity across the country.

Accessibility. The issue of accessibility is one of the major issues in Internet instruction. First of all, people in the inner land have fewer chances to access latest technology than people from coastal cities and provinces. Secondly, the universities have better access to Internet than the secondary and elementary schools. A study shows that the college students including 2-3 year technical colleges account for about 65% of Internet access, whereas secondary school students account for 23%, with only 6.44% for elementary, and 5.66% for others (CNNIC, 2001).

Digital Equity. The digital equity is another important aspect in instructional use of the Internet in China. The divide in economic status creates a divide in digital access. The economically well-offs are more likely to have computers at home, whose off-springs consequently become more computer literate than those who do not own home computers. Gender is another equity issue. The CNNIC January 2001 report showed that the male had accessed Internet more than the female with male 69.56% and female 30.44%.

Conclusions

The instructional use of the Internet in China is still in a developmental stage. Where it should go and how it should go are issues that need to be addressed immediately. We believe that a healthy development of the instructional use of the Internet in China should take following steps: (1) the government should adopt a more open, less restricted Internet policy for free information exchange and communication; (2) it should reduce the geographical differences to create an equal opportunity for people to access the information they need; (3) more funding for secondary and elementary education is needed with a focus on educational technology enhancement and the opportunity for people to access the digital technology regardless of gender, age, social and economic background.

It should be recognized that China has made great efforts to improve its education system, provide opportunities for more people to receive education, and invest in technology infrastructure in both higher, secondary and elementary education within last ten years. Such efforts could be more effective if it examines the existing issues from a global point of view, take substantial steps to loosen its control on Internet use and support the instructional use of Internet in all areas.

References

Chen, N. (1999). Lessons drawn from continuing education reform and development in the past twenty years. In He Dongchang and Zhang Chengxian (Eds.), *Chinese education reform and development in the past twenty years*. (pp. 101-11). Beijing, China: Beijing Normal University Press.

China Legal Change. (2001, April). *Internet café measures*. [On-line]. Available: http://www.chinalegalchange.com/Archiv01/C0107065.html

CNNIC (China Internet Network Information Center). (2001, October). Semiannual Survey Reports on the Development of China's Internet. [On-line]. Available: http://www.cnnic.net.cn

He, K. (1998). *Internet based educational network and educational reform in 21^{st} century.* Beijing, China: Beijing Normal University Modern Educational Technology Research Institute.

NUA Internet Surveys. (2001). *China cracks down on Internet cafes.* [On-line]. Available: http://www.nua.com/surveys/

Wang, H. (1999). A reflection on Chinese education strategies for the new millennium. In Dongchang and Zhang Chengxian (Eds.), *Chinese education reform and development in the past twenty years.* (pp. 525-35). Beijing, China: Beijing Normal University Press.

Zhang, D. (2000). Internet education network's impact on elementary education. Denver, Colorado: 2000 AECT International Conference Proceedings.

NOTICE

Reproduction Basis

- [X] This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

- [ ] This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").